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The Journal of the SOCIETY OF DYERS AND COLOURISTS

Volume 72 Number 10

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THE SOCIETY OF DYERS AND COLOURISTS
19 PICCADILLY · BRADFORD 1 · YORKSHIRE

Notice to Authors of Papers

The MSS. of all papers communicated to or read before the Society become the property of the Society. They should be addressed to the Editor, Society of Dyers and Colourists, 19 Piccadilly, Bradford 1. Authors must not allow their papers to be published elsewhere before they have appeared in the Society's *Journal*. Should prior publication take place without the sanction of the Publications Committee, the paper will be printed only as an abstract or summary.

Manuscripts submitted for publication in the *Journal* should be typewritten (double spacing) on good-quality paper, using one side of the paper only and leaving a margin at least 1 in. wide on the left-hand side. The time taken in refereeing papers (both lectures and communications) will be reduced to a minimum when authors submit two copies of the typescript.

In view of the high costs of publication, it is essential that authors should be as concise as possible. When experimental procedure has already been published, a literature reference to the paper containing the details is sufficient, whilst well known experimental methods should be described very briefly.

Introductory paragraphs describing the aims of the investigation and the method of attack are desirable, and should be followed by the experimental results and their discussion. There should be a brief summary for insertion at the beginning of the paper. References to the literature should be numbered consecutively, using superscript numbers without brackets immediately following the text words or author's name to which they refer.

The list of references should be given at the end of the manuscript and the abbreviations used should be, as far as possible, those given in the "List of Periodicals Abstracted" included at the end of the index to the preceding year's *Journal*. Reference numbers in this list should be neither enclosed in brackets nor followed by full-stops. As far as possible throughout the manuscript the abbreviations listed in the Jan. 1950 issue (p. 54) should be used. Tables should be numbered consecutively in Roman numerals and Figures in Arabic numerals.

The number of figures and graphs should be kept as low as possible, and data should be presented in the form of either tables or graphs, not both. Drawings should be carefully prepared, preferably in Indian ink, on plain white drawing paper or, preferably, Bristol board. In graphs, the frame and actual curves should be ruled and inked more heavily than any co-ordinate lines, and the latter should not be close together as in ordinary graph paper. Experimental points should always be given, and where several graphs appear in a single Figure clear means of differentiation must be adopted. All numbers and legends are set up in type by the printer, and authors should therefore indicate them lightly in pencil.

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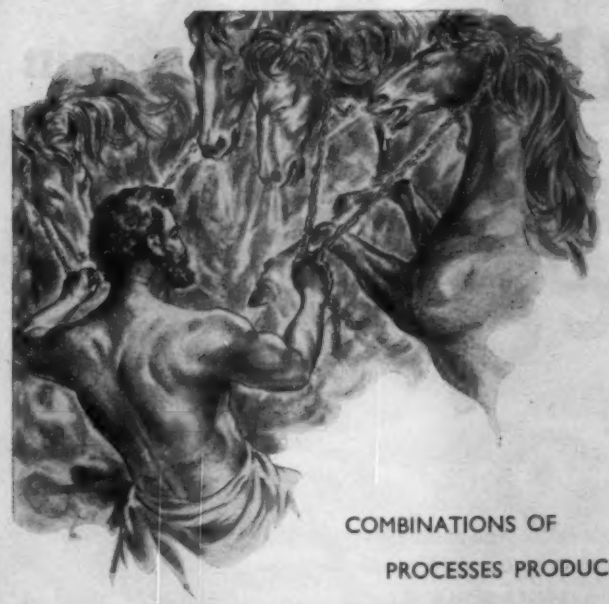

the twelve labours

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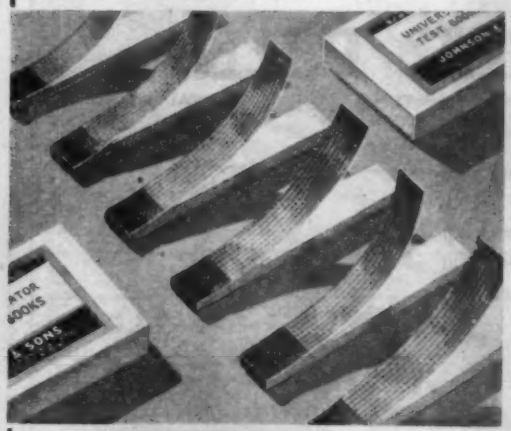

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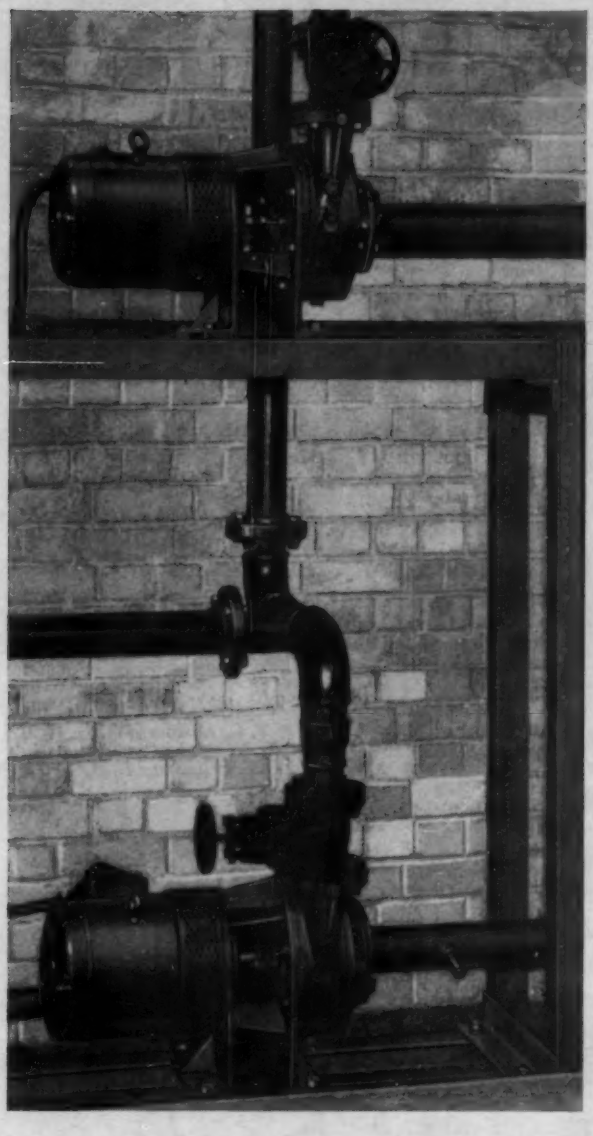

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face viii

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Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–6 of the January 1956 and pages 313–317 of the July 1956 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford 1, Yorkshire (*Telephone* Bradford 25138–9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal* —

LECTURE

The Disperse Dyes — their Development and Application — *R. K. Fourness*

COMMUNICATIONS

In the Footsteps of Perkin — *W. H. Cliffe*

Light Fastness Assessments of Dyed Textiles and their Bearing upon the Mechanism of Fading — *J. C. Eaton and C. H. Giles*

Separation of Disperse Dyes by Paper Chromatography — *K. Elliott and L. A. Telesz*

Absorption of Alkali by Wool Keratin from Aqueous Solutions of Sodium Carbonate and Bicarbonate — *R. P. Harker*

F.T.C.C. PUBLICATION

The Importance of Temperature and Relative Humidity in Light Fastness Testing — *K. McLaren*

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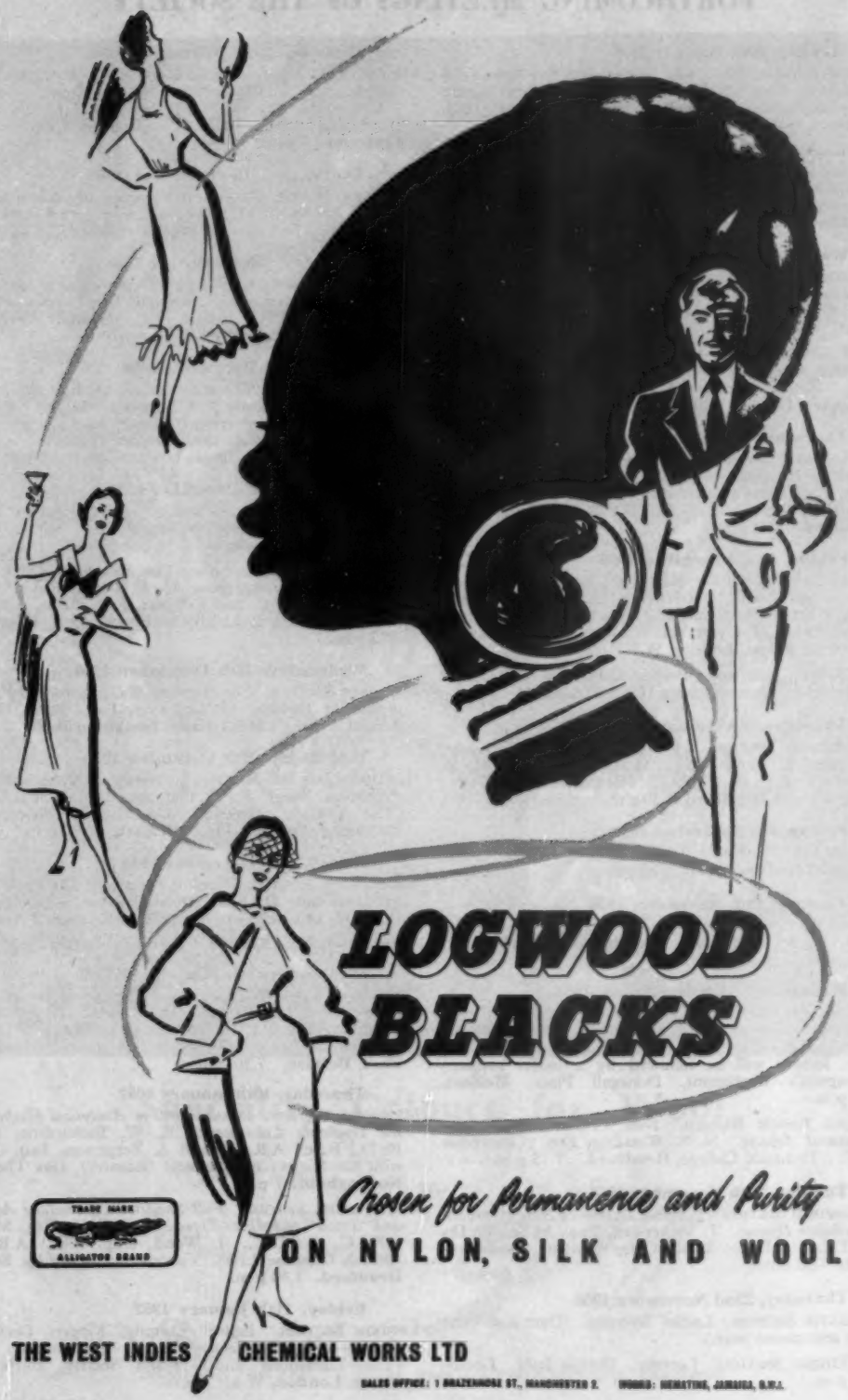
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FORTHCOMING MEETINGS OF THE SOCIETY

Monday, 29th October 1956

HUDDERSFIELD SECTION. *The History and Development of Fashions in Wool.* S. Morse-Brown Esq. (Joint lecture with Huddersfield Textile Society). Large Hall, Technical College, **Huddersfield.** 7.30 p.m.

Tuesday, 30th October 1956

BRADFORD JUNIOR BRANCH. *Printing of Nylon and other Polyamide Fibres.* R. E. Fletcher, Esq., B.Sc., A.T.I. (Clayton Dyestuffs Co. Ltd.). Technical College, **Bradford.** 7.15 p.m.

Wednesday, 31st October 1956

MIDLANDS SECTION. *Reactive Dyes— A New Approach to Cellulose Dyeing.* T. Vickerstaff, Esq., M.Sc., Ph.D., A.R.I.C., F.S.D.C. Albert Hall Institute, **Nottingham.** 7 p.m.

WEST RIDING SECTION. Perkin Centenary Lecture— *The Life and Work of Perkin.* Professor John Read, Ph.D., M.A., F.R.S. (University of St. Andrews). Hotel Metropole, **Leeds.** 7.30 p.m.

Thursday, 1st November 1956

WEST RIDING SECTION. Perkin Centenary Lecture— *Early Stages in the Renaissance of the British Dye Industry. Tales from Turnbridge, Huddersfield, 1899–1920.* C. M. Whittaker, Esq., D.Sc., F.T.I., F.S.D.C. Victoria Hotel, **Bradford.** 7.30 p.m.

Friday, 2nd November 1956

LONDON SECTION. *What the Dry Cleaner expects from Textiles and Textile Finishes.* D. D. McCordall, Esq., (Achille Serre) (Joint meeting with the London Centre of the Guild of Dyers and Cleaners). Royal Society, Burlington House, **London W.1.** 6.30 p.m.

WEST RIDING SECTION. Perkin Centenary Celebration Dinner and Dance. Victoria Hotel, **Bradford.** 7 p.m.

Thursday, 8th November 1956

WEST RIDING SECTION. *A New Approach to Dyeing.* Lecturers, L. Peters, Esq., M.Sc., Ph.D., and C. B. Stevens, Esq., Ph.D., F.S.D.C. (The University of Leeds). Victoria Hotel, **Bradford.** 7.30 p.m.

Friday, 9th November 1956

HUDDERSFIELD SECTION. Annual Dinner. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Tuesday, 13th November 1956

SCOTTISH SECTION. *Levelling Problems in the Dyeing of Vat Dyes.* H. Musshoff Esq. (Cassella). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Wednesday, 14th November 1956

NORTHERN IRELAND SECTION. Perkin Centenary Lecture— *Life and Work of Perkin.* J. Boulton, Esq., M.Sc. (Tech.), F.R.I.C., F.T.I., F.S.D.C. (Courtaulds Ltd.). (This lecture will be followed by a buffet supper.) Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

BRADFORD JUNIOR BRANCH. *New Viscose Fibre— Some Structural Aspects.* N. S. Wooding, Esq. (Courtaulds Ltd.). Technical College, **Bradford.** 7.15 p.m.

Tuesday, 20th November 1956

HUDDERSFIELD SECTION. *Reactive Dyes— A New Approach to Cellulose Dyeing.* T. Vickerstaff, Esq., M.Sc., Ph.D., A.R.I.C., F.S.D.C. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Thursday, 22nd November 1956

MANCHESTER SECTION. Ladies' Evening. (Date and Time to be announced later.)

WEST RIDING SECTION. Lecture. Details later. **Leeds.** 7.30 p.m.

Thursday, 22nd November 1956

MIDLANDS SECTION. *Applications of Colour Physics to Textiles.* (A simple account for the practical man.) J. C. Guthrie Esq., M.Sc., F.Inst.P., F.T.I., and P. H. Oliver Esq., B.Sc., Grad.Inst.P. College of Technology, **Leicester.** 7 p.m.

Thursday, 29th November 1956

BRADFORD JUNIOR BRANCH. *Petroleum Chemicals in the Textile Industry.* M. Bratherton, Esq. (Shell Petroleum Co. Ltd.). Technical College, **Bradford.** 7.15 p.m.

Thursday, 6th December 1956

WEST RIDING SECTION. *Reactive Dyes— A New Approach to Cellulose Dyeing.* T. Vickerstaff, Esq., M.Sc., Ph.D., A.R.I.C., F.S.D.C. (I.C.I. Ltd., Dyestuffs Division). Victoria Hotel, **Bradford.** 7.30 p.m.

Friday, 7th December 1956

LONDON SECTION. *The Chemical Revolution in Textile Technology.* Professor J. B. Speakman, D.Sc., F.R.I.C., F.T.I. (Leeds University). (Joint meeting with the London Section of the Textile Institute.) Royal Society, Burlington House, **London, W.1.** 6 p.m.

Tuesday, 11th December 1956

HUDDERSFIELD SECTION. *Problems of a Commission Dyer.* H. V. Partridge, Esq., M.Sc., A.T.I. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

SCOTTISH SECTION. *Full Shades on Secondary Acetate and 'Tricel' and Allied Topics.* H. C. Olpin, Esq., M.Sc., F.R.I.C., F.S.D.C. and J. Wood, Esq., B.Sc., A.R.I.C. (British Celanese Limited). St. Enoch Hotel, **Glasgow.** 7.15 p.m.

Wednesday, 12th December 1956

MIDLANDS SECTION. *The Finishing of Garments and Fabrics of Bulked Terylene.* G. McLeavy, Esq., B.Sc., Ph.D., A.R.I.C. King's Head Hotel, **Loughborough.** 7 p.m.

Wednesday, 12th December 1956

NORTHERN IRELAND SECTION. *Printing of Nylon and other Polyamide Fibres.* R. E. Fletcher, Esq., B.Sc., A.T.I. (The Clayton Dyestuffs Co. Ltd.). Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

Friday, 14th December 1956

MANCHESTER SECTION. *Pigment Printing— The Possibilities and Limitations.* Dr. Kass (Fabriken Bayer, A.G.). Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

BRADFORD JUNIOR BRANCH. Lecture. Details later.

Wednesday, 9th January 1957

NORTHERN IRELAND SECTION. *Application of Colour Physics to Textiles.* P. H. Oliver, Esq., B.Sc., Grad.Inst.P. and J. C. Guthrie, Esq., M.Sc., F.Inst.P. (Courtaulds Ltd.). Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

Thursday, 10th January 1957

MIDLANDS SECTION. *Developments in Analytical Methods in the Dyehouse Laboratory.* R. W. Richardson, Esq., Ph.D., B.Sc., A.R.I.C. and Z. Bergmann, Esq. (Joint with the Society of Chemical Industry). Gas Theatre, **Nottingham.** 7 p.m.

WEST RIDING SECTION. *Full Shades on Secondary Acetate and "Tricel" and Allied Topics.* H. C. Olpin, Esq., M.Sc., F.R.I.C., F.S.D.C., J. Wood, Esq., B.Sc., A.R.I.C. (British Celanese Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 11th January 1957

LONDON SECTION. Ladies' Evening. *Kippers, Cocktails, Confectionery & Colour.* G. J. Chamberlin, Esq. (The Tintometer Ltd.). Royal Society, Burlington House, **London, W.1.** 6 p.m.

continued on page xiv

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THE JOURNAL

OF THE

Society of Dyers and Colourists

Volume 72 Number 10 OCTOBER 1956 *Issued Monthly*

Proceedings of the Society

The Separation and Examination of Fibre Blends

F. W. LINDLEY

Meeting of the Huddersfield Section held at the Victoria Café, Huddersfield, on 20th September 1955, Mr. J. Calvert in the chair

A flotation method of wide applicability for the separation of fibre blends has been developed. The method has been used for quantitative separations and in the examination of blends where information about the physical or chemical properties of the component fibres was required.

There are several reasons for requiring to separate a blend of fibres—

(1) As an aid to identification

(2) For quantitative determination of the composition of the blend

(3) Quantitative or qualitative separation followed by determination of specific properties of the component fibres.

About (1) little need be said except to remark that it is generally an advantage to have a fibre free from other fibres before carrying out some diagnostic tests.

The quantitative separation is most important, and this has become increasingly so in view of the growing use of blend fabrics during the post-war years. The potentially large number of blends made available by the manufacture of the newer man-made fibres makes it certain that this trend will continue. To the comprehensive table published by Howlett, Morley, and Urquhart in 1942 [1] may be added Courpleta, Orlon, Terylene, and dynel, to mention but four of the more recently developed fibres. Multifibre blends also are likely to be encountered more often.

Some blends are easy to separate, others are difficult, and it is unlikely that a universal method for all blends will be readily devised. One method of wide applicability is the flotation method, which forms the subject of this paper.

The credit for developing the method goes to Larose [2], who outlined its use in 1938. The essentials of the method are as follows—The fibre blend is chopped into small pieces, preferably not greater than 1 mm. in length, and then immersed in an inert liquid of density midway between the densities of the two fibres. The lighter fibre floats, and is decanted off and weighed; the heavier fibre is subsequently recovered and weighed. The possible scope of the method may be gauged from Table I [3], which lists the densities of some natural and man-made fibres.

Three main groups of fibres have densities sufficiently far apart to allow of easy separation —the acrylic and polyamide fibres, below 1·2 g. per ml.; the natural and regenerated protein fibres, around 1·3 g./ml.; and the cellulosic fibres, around 1·5 g./ml.

TABLE I

Specific Gravity of Fibres

Rilsan (Organico) (11-nylon)	1·05
6,6-Nylon	1·14
Orlon 42 (DuP) (polyacrylonitrile staple)	1·14
Angora fur	1·15
Acrilan (Chemstrand) (modified acrylic)	1·17
Orlon 81 (DuP) (polyacrylonitrile filament)	1·17
Perlon (6-nylon)	1·17
Cellulose acetate, delustred with soap	1·18
X 51 (American Cyanamid) (acrylonitrile–vinyl acetate copolymer)	1·18
Courpleta (Courtaulds) (cellulose triacetate)	1·27
Vinyon N, dynel (60% polyvinyl chloride + 40% polyacrylonitrile)	1·29
Fibrolane (Courtaulds), Ardil (ICI) (regenerated protein fibres)	1·30
Wool, non-medullated	1·30
Cellulose acetate	1·31
Tussah silk	1·32
Cellulose acetate, delustred with titanium dioxide	1·33
Seraceta (Courtaulds), cellulose acetate yarn	1·34
Silk	1·34
Vinyon (vinyl chloride–vinyl acetate copolymer)	1·36
Rhovyl (Rhodiaceta) (polyvinyl chloride)	1·39
Terylene (ICI) (polyethylene terephthalate)	1·39
Cellulose acetate, water-soluble	1·40
Acetylated cotton	1·43
Fibre E (DuP) (modified viscose rayon)	1·48
Jute	1·48
Fibro (Courtaulds) (viscose rayon staple)	1·52
PeCe (Agfa Wolfen) (chlorinated polyvinyl chloride)	1·54
Cotton	1·55
Ramie	1·55
Saran (85% polyvinylidene chloride + 15% polyvinyl chloride)	1·72
Alginate, calcium	1·72

With the aid of a similar table, Luniak [4] splits the fibres into groups on the assumption that, for a quick and accurate separation, the densities of the fibres must differ by at least 0·08 g./ml. However, with the present modified method much finer separations may be accomplished, e.g. of Fibro–cotton and wool–Fibrolane blends, although the experimental procedure is rather more complicated than for a straightforward case such as nylon–viscose rayon, where the density difference is relatively large.

To take the simpler cases first, viz. where the density difference is not less than 0·1 g./ml., the details of the method are as follows— The fibre blend, which may be in the form of fabric, yarn, or loose staple, is chopped into small pieces approx. 1 mm. in length. The cutter in routine use in the Research Laboratory at Droylsden is a Linen Industries Research Association cutter, modified by the addition of a suitably geared electric motor, which leads to more convenient operation than hand turning. This gives a 1-mm. cut at the rate of about 100 cuts/min., and the blade will take strips of fabric up to $\frac{3}{4}$ in. wide. For obvious reasons, fabrics are always cut "on the cross".

A simpler machine, which may be constructed in any workshop, has as its basis a pair of good-quality scissors. These are silver-soldered to the end of a brass block mounted on a stand and driven by an electric motor. Both hands are left free to guide the material through the blades, and a suitably placed guard protects the fingers from possible harm. Omitting the motor from the above arrangement gives a simple but efficient device, which may be clamped to the edge of a bench with a G clamp and operated by hand.

The chopped fibres are dried, and weighed into glass tubes $4\frac{1}{4}$ in. × 1 in. with a constriction $\frac{1}{8}$ in. in diameter halfway down. About 0·5 g. of fibre is weighed into each tube, which is then almost filled with a mixture of xylene and pentachloroethane such that its density lies midway between those of the fibres. The correct proportions are calculated simply from the relation—

$$\text{Density of mixture (at 25°c.)} = 0{\cdot}853 + 0{\cdot}820\,V$$

(V = volume fraction of pentachloroethane; the densities of xylene and pentachloroethane are taken as 0·853 and 1·673 g./ml. respectively). Other liquids may be employed, but pentachloroethane has been found useful, since it has a high density, and hence the addition of a small volume to a mixture causes a reasonable change in density. In general, close temperature control has not been found necessary.

The tubes are closed with hard rubber stoppers and shaken vigorously to disperse the fibres. Particles of highly twisted yarns may be broken up by boiling for a few minutes and then cooling. The tubes are next centrifuged at 1000 ***g*** for 5 min., whereupon the fibres separate. If on visual examination the separation does not appear to be complete, the lighter fibres are decanted into another tube, which, together with the original tube, is topped up with liquid. After shaking to disperse the fibres, the tubes are centrifuged again at 1000 ***g*** for 5 min. The lighter fibre is then decanted into a tared No. 3 sintered-glass crucible — the constriction in the tube prevents undue disturbance of the heavier fibre. The latter is filtered off into another crucible, both crucibles are dried and weighed, and the composition of the blend is calculated directly. The weighing of the blend before separation serves as a check.

The results in the tables which follow are all calculated on oven-dry weight of fibre. In practice it will generally be required to know the composition of the air-dry blend, account having been taken of the different regains of the particular fibres [5]. The percentage composition of the air-dry blend may be calculated from the oven-dry weights as follows—

$$\%\ \text{Fibre A} = \frac{A \times (100 + R_A)}{[A \times (100 + R_A)] + [B \times (100 + R_B)]} \times 100$$

where A and B are the oven-dry weights of fibres A and B respectively, and R_A and R_B are their official regains.

The following figures may be taken as a rough guide to the length of time required to carry out a straightforward determination: chopping 5–15 min., weighing, separation, and filtering 35–45 min., drying 2 hr. It is often advantageous to stain the fibres in contrasting colours, as a visual check on the degree of separation is thereby facilitated. This entails a longer period for drying before commencing the separation, making a total time of 4–5 hr. with about 1 hr. of actual bench work.

In most cases the use of Shirlastain A (supplied by ICI) or Neocarmin MS (supplied by Brown & Forth Ltd.) is satisfactory for the differential staining, but where the blend consists of two cellulosic fibres such as cotton and viscose rayon or two protein fibres such as wool and Fibrolane, these stains do not give very contrasting results. Blends of cotton and viscose rayon have been stained satisfactorily with DuPont Identification Stain No. 4 or by using a modification [6] of the method of Goldthwait, Smith, and Barnett originally intended as a test for cotton maturity. For wool–Fibrolane blends Azogeranine 2GS (ICI) has proved a useful stain.

The method adopted for blends of this latter type, where the density difference is of the order of 0·02 g./ml., consists in commencing with a liquid mixture which has a rather lower density than that ultimately required. Pentachloroethane is then added a few drops at a time, and the liquid centrifuged for a minute or so until the lighter fibre begins to separate. Centrifuging is then continued for 5 min., and the separation is carried out as before.

Where the densities are very close, this procedure must be repeated several times to bring about complete separation, but very few cases have been met with in which separation is impossible.

The results obtained for a number of made-up mixtures are shown in Table II. The figures in the last column are based on the difference between the weight taken and the weight recovered for each fibre. The efficiency of separation has been checked by microscopic examination, and varies

from virtually 100% for blends such as Fibro–Fibrolane to about 3% contamination of each component in a viscose rayon–cotton blend.

Besides these made-up mixtures, the blends shown in Table III have been examined in yarn or fabric form to check the composition of the blends. Typical results are shown, calculated on dry weight of fibre. In the case of the wool–Terylene blend the results of four separate determinations on 0·2–0·5 g. of yarn are shown to indicate the order of agreement obtained. The last column shows the overall loss during each determination.

TABLE II

Made-up Mixtures

Components	Density	Percentage in Mixture		Loss or Gain (%)
		Actual	Found	
Cellulose acetate	1·31	63·0	63·0	−0·1
Viscose rayon	1·52	37·0	37·0	−0·2
Fibrolane	1·30	49·6	50·0	+0·4
Wool	1·31	50·4	50·0	−1·0
Fibro	1·52	56·1	56·9	+0·6
Cotton	1·55	43·9	43·1	−2·2
Fibrolane	1·30	58·2	58·0	−0·4
Fibro	1·52	41·8	42·0	+0·7
Nylon	1·14	45·2	45·1	−0·1
Wool	1·30	54·8	54·9	−0·1
Nylon	1·14	52·4	52·5	−1·4
Cotton	1·52	47·6	47·5	−1·5
Courpleta	1·27	47·1	46·9	−1·8
Fibro	1·52	52·9	53·1	−1·6
Orlon 42	1·14	20·3	20·2	−0·2
Fibrolane	1·30	16·0	16·1	+0·5
Fibro	1·52	63·7	63·7	+0·7

Apart from its use in purely quantitative determinations, the method has been used in investigations of a more complex nature. Thus when a cellulose acetate–viscose rayon fabric is crease-resisted by the application of a urea–formaldehyde resin, the uptake of resin is not the same for each component. A knowledge of the exact distribution of resin between the two constituent fibres of the fabric is important from a purely theoretical point of view, as an aid to the finisher in the production of satisfactory crease-resisted fabrics, and also in connection with the control of the quality of the finished fabrics. The uptake of resin is roughly proportional to the water

TABLE III

Blended Yarns and Fabrics

Component	Form of Blend	Reputed (%)	Found (%)	Loss (%)
Fibrolane	Fabric	30	30·2	0·2
Fibro		70	69·8	
Fibrolane	Fabric	33·3	35·9	0·4
Fibro		66·7	64·1	
Courpleta	Fabric	60	58·9	0·2
Fibro		40	41·1	
Wool	Yarn	45	45·3	0·9
Terylene		55	54·7	
			45·0	0·7
			55·0	
			45·3	1·7
			54·7	
			45·9	2·1
			54·1	
Orlon 42	Yarn	55	56·8	—
Fibrolane		20	18·6	
Fibro		25	24·6	
Nylon	Fabric	10	8·7*	0·2
Cellulose acetate		40	28·1	
Viscose rayon		50	63·2	

* Discrepancy due to fact that fabric was crease-resist finished.

imbibition of the original fibre, and so the distribution might possibly be inferred from a consideration of this property [7]. The distribution of resin in crease-resisted cellulose acetate–viscose rayon fabrics can now be determined by separating the components, and then stripping off the resin by acid hydrolysis. It is thus possible to determine directly the percentage of the total resin on each fibre.

The complete results of several determinations are shown in Table IV. It may be seen that in these blends the percentage of resin on the viscose rayon is roughly ten times that on the cellulose acetate. Of the total resin on the fabric, only a few per cent is actually associated with the cellulose acetate.

The problem of determining the extent of damage to blend fabrics during processing or subsequent use is one which is often difficult to solve. The flotation method of separation offers a possible answer, since physical or chemical tests may be carried out on the separated components. In practice this has proved useful in investigating the effects of scouring, dyeing, and other processing

TABLE IV

Distribution of Resin on Cellulose Acetate–Viscose Rayon Fabrics

	Composition of Original Fabric (%)*		Resin on Each Component (%)	% of Total Resin on Each Component (calc.)	Total Resin on Fabric (%)	
					Calc.	Found†
A	Viscose rayon	77·7	7·1	97·2	5·7	7·1
	Cellulose acetate	22·3	0·7	2·8		
B	Viscose rayon	75·0	16·9	96·8	13·1	14·6
	Cellulose acetate	25·0	1·7	3·2		
C	Viscose rayon	75·4	10·5	97·0	8·2	8·6
	Cellulose acetate	24·6	1·0	3·0		
D	Viscose rayon	80·3	11·1	97·6	9·1	11·3
	Cellulose acetate	19·7	1·1	2·4		

* Determined after stripping resin from fabrics A, B, and C, but on plain-finished fabric D; calculated on oven-dry weight.

† Determined directly on separate samples of crease-resisted fabric.

conditions on the properties of constituent fibres in Fibrolane–wool, Fibrolane–Fibro, and Fibrolane–rabbit fur blends. Water imbibition and fluidity are typical properties which have been measured on small samples resulting from separation by flotation.

Giles and Shaw [8] have used the flotation method to separate small quantities of fibres from dyed blends to determine the amount of dye on each fibre.

These few examples give an idea of the possible scope of the flotation method in the examination of fibre blends, a subject which is sure to increase in importance during the coming years.

* * *

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RESEARCH LABORATORY
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(*MS. received 16th November 1955*)

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Discussion

Mr. S. PEEL: Which is the recommended method for the quantitative determination of cotton–viscose rayon blends and how does the accuracy of the chemical methods compare with that of the flotation method?

Dr. LINDLEY: There is no universally recognised standard method in this case, and laboratories probably make use of a preferred method based on their own experience. The method which is used at Droylsden, and which can be recommended, is a modified sodium zincate method, with which results accurate to about 1% may be obtained. This method has been found to be more suitable than the calcium thiocyanate or the sulphuric acid method. With cotton–viscose rayon blends the flotation method has so far given results accurate to about 3%, as shown by separation followed by microscopic counting.

The chief reason for developing the flotation method is to allow of further examination of the separated fibres. It is also thought that the method may be more suitable for degraded fabrics, since in these cases chemical methods are less reliable.

Mr. F. JORDINSON: What type of centrifuge has been used? Is it essential to use a power centrifuge?

Dr. LINDLEY: In most cases an MSE (Measuring & Scientific Equipment Ltd.) laboratory centrifuge has been used, but good results may be obtained with a hand centrifuge, particularly with the simpler blends.

Mr. J. A. WALLWORK: Can accurate results be obtained by cutting up by hand?

Dr. LINDLEY: Yes, provided that sufficient care is taken to ensure that no long pieces of yarn are mixed in with the chopped fibres.

The Behaviour of Formaldehyde-sulphoxylate in Vat Printing

R. THORNTON and W. F. LIQUORICE

Based on a Lecture given by R. Thornton to the Manchester Section at the Textile Institute, Manchester, on 17th September 1954, Mr. G. S. J. White in the chair

An experimental method for the determination of the Formosul concentration on a print, described in the paper, has been used to investigate the rate of decomposition of Formosul during the various stages of the vat printing process. The effects of the constituents of the print paste, drying and storage conditions, temperature, and conditions during steaming are examined.

It has been shown by Marshall and Peters [1] and by Michie and Thornton [2] that printing with vat dyes depends upon three apparently unrelated fundamental properties of any given vat dye—(*a*) its "leuco potential", (*b*) its rate of reduction, and (*c*) its rate of diffusion.

Today, the conventional method of printing with vat dyes accepts only one reducing agent, sodium formaldehyde-sulphoxylate, i.e. Formosul, although a few side glances are being cast at the dyers' chemical, sodium hydrosulphite powder. Both of the above papers endeavour to demonstrate by physicochemical and technological treatment that, in spite of attempts to relate the technical performance of a vat dye to measured values of its "leuco potential", the concentration of Formosul in the printing paste is the dominant factor. Such investigations have defined and explained technical perimeters within which the practical printer must attempt to confine his process variables, but even so, a scrutiny of typical day-to-day full-scale problems left it uncertain whether the results thus made available constituted an adequate explanation. Although it was realised that Formosul decomposition at the wrong time or place is the root cause of most of the troubles of vat printers, our knowledge still seemed vague and unsatisfactory as to the extent of

Formosul decay at various stages and in particular as to the precise character of the factors influencing decay rates. This paper, then, describes a preliminary attempt to examine these factors, and to a limited degree explains and answers some of the printer's problems.

EXPERIMENTAL PROCEDURE

The experiments have for convenience been confined to cotton, and the recipes for the print pastes to the typical formulation used in vat printing, containing dye, thickening, Formosul, alkali, and glycerol. The processing has been according to the scheme: print, dry, steam, oxidise, and soap. Meticulous care was taken at all stages to eliminate print-to-print variations, and considerable preliminary work was carried out to ensure reproducibility of the laboratory-scale printing technique.

A first requisite was a reliable method of estimating Formosul, not only in solution but also on printed fabrics; in this the lead of Jellinek [3], Specht [4], and others was followed, and it was noted that Furness and Hannay [5] had used similar methods with success in conducting Formosul estimations. Briefly, the method entails preparing an aqueous extract from a known area of printed cloth, adding excess of formaldehyde, adjusting the pH to 3·5 with dilute hydrochloric acid using universal indicator paper, and titrating the extract with 0·1N. iodine. The usual starch indicator is added except when British gum has been used in the print paste, in which case sufficient British gum dissolves out to serve as indicator. The reactions which occur when Formosul decomposes are complex, and it is not the purpose of this paper to study them in detail, except to note that sodium sulphite and bisulphite are among the non-volatile residues, and since both react with iodine, they must be rendered inactive before titration to avoid an erroneously high iodine titre. This is the purpose of the addition of formaldehyde before titration. Fig. 1 shows a typical decay curve of Formosul obtained on steaming a print made with a paste containing British gum, 13·5% of potassium carbonate, 5% of glycerol, and 8% of Formosul. The graph shows that in the absence of formaldehyde the estimation of the rate of decay is too low on account of the falsely high iodine titre. When this method is used to investigate the variations of Formosul concentration on prints, it is not necessary to calculate the quantity of Formosul present, although this can readily be done, but merely to compare the iodine titres directly. In the preparation of the tables and graphs illustrating this paper, this was the method adopted. The actual quantity of Formosul can be calculated, if required, from the relation [4]—

$$NaHSO_2,H{\cdot}CHO,2H_2O + 2I_2 = NaHSO_4 + 4HI + H{\cdot}CHO$$

1 ml. of 0·1N. iodine = 0·00385 g. of Formosul

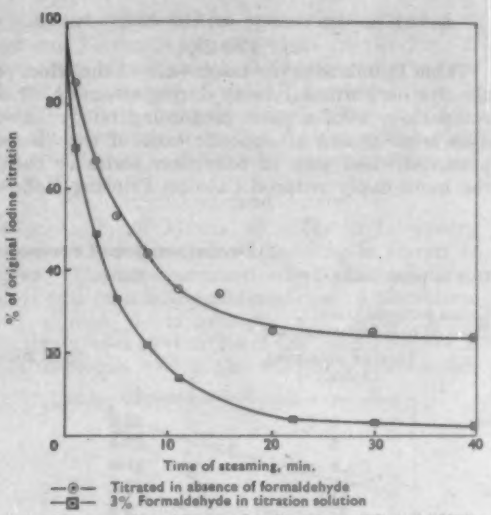

FIG. 1—Decomposition of Formosul on Steaming—Effect of Addition of Formaldehyde during Titration
(Initial concentration of Formosul in print paste = 8%)

An acceptable technique having been established, a series of experiments was carried out to investigate the behaviour of Formosul during the various stages of the vat printing process, and this was subdivided as follows—(1) the substrate, (2) the constituents of the print paste, (3) effects produced between printing and steaming, and (4) effects during steaming.

1. THE SUBSTRATE

Table I shows the residual Formosul observed when different fabrics, after being printed with a typical vat printing paste, were steamed for various times. It is evident that, provided the substrate has been properly bleached, its effect may be disregarded. The case of partly scoured linen is interesting, and here is good evidence that the natural colouring matters in linen act as unwanted catalysts, increasing the rate of Formosul decay. Many printers are familiar with the difficulty of printing linen with vat dyes, and this effect offers a partial explanation.

TABLE I

Effect of Fabric on the Decomposition of Formosul during Steaming

Time of Steaming (min.)	% of Initial Formosul remaining (8% in print paste initially)				
	Mercerised Cotton Sateen	Viscose Rayon Staple (light-weight)	Cuprammonium Rayon (plain-weave)	Linen Caustic-shrunk	Linen Unbleached
1	74	74·2	72·5	77	65
3	49·8	44·5	46·1	46·6	38
5	31·7	30·8	27·4	28·7	22·6
8	21·6	18·7	13·7	15·7	6·9
11	14·3	12·7	6·6	7·3	1·6
15	8·4	7·8	3·8	4·0	1·0
20	4·0	6·3	3·3	3·6	—

2. THE CONSTITUENTS OF THE PRINT PASTE

(a) *The Dye*

Table II indicates the magnitude of the effect of the dye on Formosul decay during steaming. For comparison with a paste containing no dye, two dyes were chosen at opposite ends of the "leuco potential" and rate of reduction scales[1]. Thus, the more easily reduced Caledon Printing Yellow GNS Paste markedly increases the decay rate. All the print pastes used contained 13·5% potassium carbonate. The two dyes of Table II show similar differences in their effect on Formosul when the prints are stored before steaming. Prints were exposed to the laboratory atmosphere after drying in a hot-air stove at 70°C. and also after drying at room temperature, representing machine and screen printing conditions respectively, and Table III shows the greater catalytic effect of the dye having the less negative leuco potential. This effect is even greater when drying is slow. Table III also shows the adverse effect on Formosul of slow drying—a fact well known to screen printers.

TABLE II

Decomposition of Formosul during Steaming of the Print

Dye in print paste	None	10% Caledon Printing Yellow GNS Paste	10% Caledon Red 5GS Paste Fine
Leuco potential, mv.[1]	—	−753	−900
Time of half-reduction, sec.[1] ...	—	5	110
Time of Steaming (min.)	% of Initial Formosul remaining (8% in print paste initially) (all pastes contained 13·5% K_2CO_3)		
1	75	71·6	74·8
3	49·6	43·3	50·3
5	33·4	28·3	32·9
8	21·6	16·0	21·1
11	13·8	8·6	17·8
22	3·9	3·1	4·9
30	2·8	2·4	3·0
40	2·8	2·3	3·0

TABLE III

Decomposition of Formosul during Storage of the Print before Steaming

Dye in print paste ...	None		10% Caledon Printing Yellow GNS Paste		10% Caledon Red 5GS Paste Fine	
Leuco potential, mv.[1]	—		−753		−900	
Temp. of drying ...	Room	70°C.	Room	70°C.	Room	70°C.
Time of Storage (min.)	% of Initial Formosul remaining (8% in print paste initially) (all print pastes contained 13·5% K_2CO_3)					
0	100	100	100	100	100	100
21	85·9	93·8	65·8	77·2	81·5	87·8
44	75·6	81·7	43·4	57	76·6	63·9
60	56·7	63·4	27·5	36·9	48·8	61·2

TABLE IV

Effect of Various Alkalis in the Paste on the Decomposition of Formosul during Steaming of the Print

Time of Steaming (min.)	% of Initial Formosul remaining (8% in print paste initially)		
	13·5% K_2CO_3 (anhyd.)	6% Na_2CO_3 (anhyd.)	6% NaOH (flake)
0	100	100	77·1
1	72·2	82·2	46·4
3	53·3	63·2	37·1
5	42·5	41·0	27·8
8	30·4	29·9	22·2
11	24·3	22·1	17·4
15	16·7	13·8	13·25
20	11·4	9·7	10·3

(b) *Effect of Alkali in the Print Paste*

Although potassium carbonate is the alkali generally used in vat printing, judicious use of caustic soda is a well established practice with certain dyes. Table IV shows that caustic soda produces unstable conditions and very rapid initial decay, 23% of the initial Formosul being lost

TABLE V

Effect of Composition of Print Pastes on Reduction Potential[1]

Thickening	Alkali	Reducing Agent	Potential (mv.)
Gum tragacanth ...	13·5% K_2CO_3	—	−720
British gum... ...	13·5% K_2CO_3	—	−724
British gum... ...	13·5% K_2CO_3	1% Formosul	−757
British gum... ...	13·5% K_2CO_3	8% Formosul	−960
Gum tragacanth ...	13·5% K_2CO_3	8% Formosul	−980
British gum... ...	8% NaOH	2% Formosul	−980
British gum... ...	8% NaOH	8% Formosul	−1082
British gum... ...	13·5% K_2CO_3	8% $Na_2S_2O_4$	−1025
British gum... ...	8% NaOH	2% $Na_2S_2O_4$	−1030

on drying alone under ideal conditions. On the other hand, sodium and potassium carbonates show very little difference under steaming conditions. Prior to steaming, however, when moisture adversely affects Formosul stability, sodium carbonate has the advantage of being efflorescent, a fact exploited by screen printers with table-drying problems. The value of caustic soda in certain cases is due to the large electronegative potential shown by print pastes containing caustic soda compared with carbonate–Formosul print pastes (Table V), and this is made use of in printing with dyes like Calodon Brown RS Paste Fine, which has a leuco potential of −923 mv. Nevertheless, problems due to the instability of the Formosul–caustic system can be anticipated when the fixation properties of the dye are critically dependent on Formosul concentration, as in Fig. 2. Pad–steam development is the obvious answer where the danger of casual Formosul loss is absent. This is shown by Fig. 3, where it is seen that the same dye as in Fig. 2 gives a high yield over a wide range of Formosul concentrations.

(c) *Thickening Agents*

The combined effects of different thickening agents and storage before steaming is shown in Fig. 4. The most marked effect of thickenings before steaming is a mechanical one. A thickening with a high solids content, e.g. British gum, effectively encases the Formosul, and protects it from oxidation by the air; whereas a lower-solids

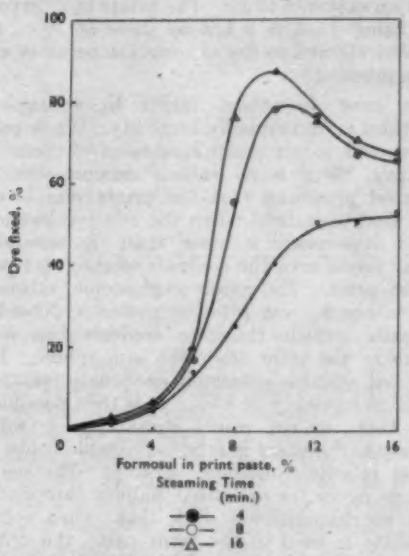

FIG. 2—Variation of Formosul Concentration in Print Paste (15% Caledon Brown RS Paste Fine)[3]

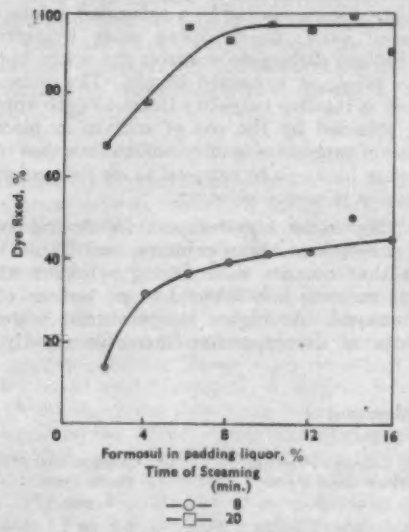

FIG. 3—Formosul Sensitivity of 15% Caledon Brown RS Paste Fine in the Pad–Steam Process

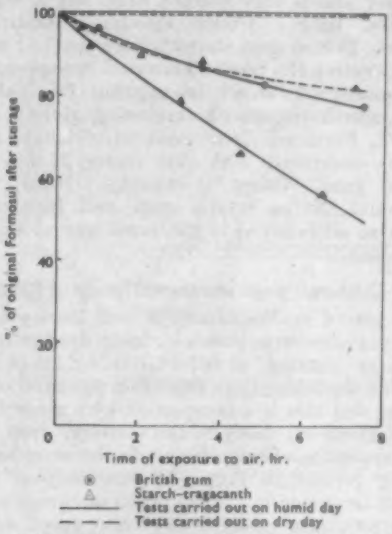
% of original Formosul after storage
Time of exposure to air, hr.
British gum
Starch–tragacanth
Tests carried out on humid day
Tests carried out on dry day

FIG. 4—Effects of Thickening and Humidity on Decomposition of Formosul during Storage of Prints (Initial concentration of Formosul in print paste = 8%)

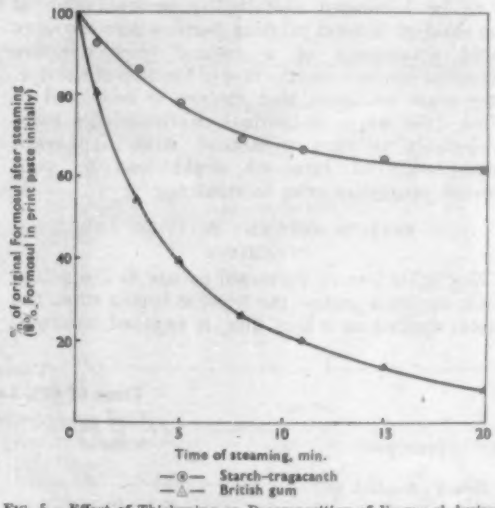
% of original Formosul after steaming (8% Formosul in print paste initially)
Time of steaming, min.
Starch–tragacanth
British gum

FIG. 5—Effect of Thickening on Decomposition of Formosul during Steaming (Initial concentration of Formosul in print paste = 8%)

TABLE VI

Effect of Reduction Catalysts on the Decomposition of Formosul during Steaming of the Print

Catalyst added to paste* ...	None	0·1% Anthraquinone	0·25% Ferrous Sulphate	0·1% Caledon Yellow GN
Time of Steaming (min.)	% of Original Formosul remaining (8% in print paste initially)			
1	80·0	76·5	72·6	77·4
3	58·5	50·2	43·8	53·8
5	40·7	31·7	20·8	33·6
8	25·8	15·3	8·0	23·0
11	15·2	6·9	3·4	11·3
15	7·0	3·1	2·7	5·6
20	4·1	2·8	2·7	4·2

* Expressed as % of solid agent on weight of print paste

starch thickening offers far less protection, resulting in a more rapid rate of decomposition. The effect of humidity also is very marked here, but it will be discussed later. Under steaming conditions, however, British gum shows a very marked effect in accelerating the rate of Formosul decomposition as compared with starch–tragacanth. Fig. 5 shows that a starch–tragacanth thickening gives a time for 50% Formosul decomposition of longer than 20 min., compared with just under 3½ min. for British gum. Other thickenings tested were tragacanth, Nafka crystal gum, and Indalca U, and these all behaved in the same way as starch–tragacanth.

(d) Deliberate and Accidental Catalytic Effects

The use of anthraquinone is well known as an addition to discharge pastes for azoic-dyed grounds. The extra "cutting" or reducing action arises from the more electronegative reduction potential of the system, and this is accompanied by a more rapid rate of Formosul decay in the steamer. Iron salts have a similar effect. They can be a nuisance, causing premature Formosul loss coupled with possible tendering in viscose rayon discharge work, but as reduction catalysts they may speed up the rate of fixation. Table VI shows the rate of Formosul decomposition in steam in presence of various catalysts. If, however, this catalytic effect is to be harnessed usefully by incorporation of the catalyst in a vat printing paste, where the more rapid attainment of a greater electronegative potential can increase the rate of fixation of the dye, care must be taken that its use is restricted to those dyes whose individual characteristics react favourably to such treatment, since haphazard introduction of catalysts could lead to poor storage properties prior to steaming.

3. EFFECTS BETWEEN PRINTING AND STEAMING

Negligible loss of Formosul occurs in the actual made-up print pastes: the trouble begins when the paste, applied as a thin film, is exposed to atmospheric moisture and oxygen between printing and steaming. Tables III and VII show how Formosul is lost on exposure to air. The prints were exposed after being dried in a hot-air stove at 70°C., and also were allowed to dry at room temperature as in screen printing.

The most important factor in atmospheric conditions is undoubtedly humidity. When prints are exposed to air under conditions of controlled humidity, there is no serious decomposition of Formosul providing that the prints remain dry. Such conditions hold when the relative humidity of the atmosphere is lower than the saturation vapour pressure of the contents of the print paste on the print. The most hygroscopic substance used in normal vat printing pastes is potassium carbonate, which therefore controls the water uptake of the print from the atmosphere. In a saturated solution potassium carbonate maintains a relative humidity of 45%. It is thus possible to state that, in vat prints containing potassium carbonate, Formosul is relatively stable below the critical relative humidity of 45%. The corresponding figure for saturated sodium carbonate is 87%, but experiments show that, when sodium carbonate is used in the print paste, the critical value of atmospheric humidity is only increased to around 60% R.H. This is evidently the humidity corresponding to a saturated solution of Formosul itself, which, being more hygroscopic than sodium carbonate, controls the water uptake of the print on exposure to air. The increased latitude in relative humidity (from 45% to approx. 60%) attained by the use of sodium in place of potassium carbonate is of considerable value when prints are likely to be exposed to air for prolonged periods, as in screen printing.

Stability under high-temperature drying conditions concerns machine printers, and Table VIII shows that contact with drying cylinders under normal running conditions has no serious effect on Formosul. At higher temperatures, however, the rate of decomposition increases rapidly, as

TABLE VII

Time of 50% Loss of Formosul

(Time in hr. derived from Table III)

Dye in print paste ...	None	10% Caledon Printing Yellow GNS Paste	10% Caledon Red 5G8 Paste Fine
Leuco potential, mv.[1] ...	—	−753	−900
Without drying	82	36	66
After drying at 70°c. ...	92	52	92

TABLE VIII

Decomposition of Formosul in the Print on Drying Cylinders at 118°C.

Dye in print paste ...	None	10% Caledon Printing Yellow GNS Paste	10% Caledon Red 5GS Paste Fine
Time of Drying (sec.)	% of Initial Formosul remaining (8% in print paste initially)		
15	100	98·9	100
30	95·5	96	97

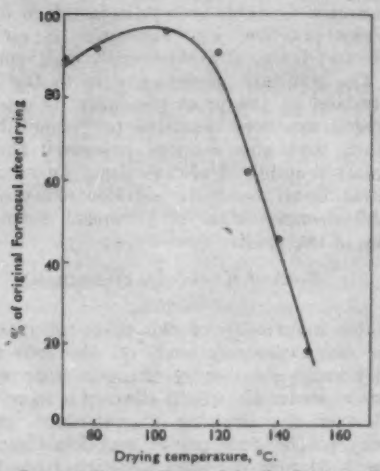

FIG. 6—Decomposition of Formosul in the Print on Drying at Different Temperatures
(Initial concentration of Formosul in print paste = 8%)

shown by Fig. 6. This demonstrates the dangers of stopping on high-pressure cans such as the modern stainless-steel high-pressure, high-speed, siphon-extraction types now in common use in the U.S.A. One should also bear in mind any hybrid printing style in which resin-bonded pigments are expected to work alongside vat dyes, where baking must precede steaming. The effect of temperature is also relevant to the effect known to printers as "sweating", i.e. a rise in temperature of printed goods due to slow chemical reaction during the time the prints are piled down awaiting steaming. In such cases excessive rise in temperature will bring about loss of Formosul with consequent loss of yield on the prints.

4. EFFECTS DURING STEAMING

The effects of print paste constitution on Formosul decomposition during steaming have already been discussed. The other two important factors are the Formosul concentration and the moisture content of the print as it enters the steamer. Fig. 7 shows that the rate of decomposition is a function of the initial concentration, and from these curves Table IX was compiled to emphasise the narrow working limits when standard print pastes based on 4% (approx. 6 oz./gal.) Formosul are used. Many vat dyes have times of reduction approaching the 90 sec. decay time of Formosul in steam, and since the effective reducing action, i.e. reduction potential, is also a function of concentration (Fig. 8), the chances of good fixation can be remote. Fig. 8 shows how a print paste, stored at 98°C., loses its reducing power much more rapidly

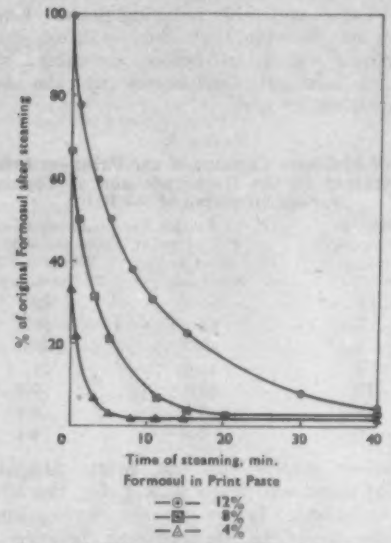

FIG. 7—Effect of Initial Concentration of Formosul on Decomposition on Steaming

TABLE IX

Decomposition of Formosul during Steaming of Prints containing Various Amounts of Formosul initially

(Taken from Fig. 7)

Initial Formosul Concn. (%)	Initial Formosul Concn. (oz./gal.)	Time for 50% Loss (min.)
4	6·4	1·5
8	12·8	2·8
12	19·2	5·0

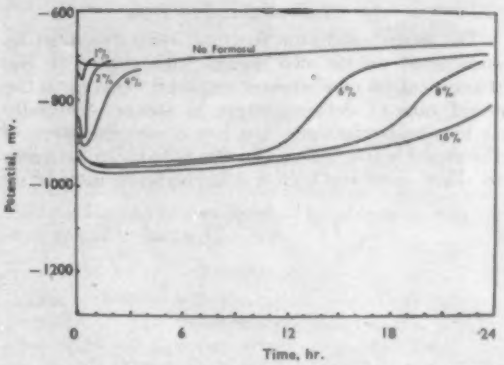

FIG. 8—Rate of Change of Potential for Print Paste containing British Gum, Potassium Carbonate, and Various Concentrations of Formosul[1]

when the initial concentration is low. This graph was plotted from results obtained on a print paste in bulk[1]. The same results would apply under

steaming conditions for a print, but as the paste is then exposed as a thin film the times would be much shorter. Fig. 8 is perhaps more easily understood when it is borne in mind that, although a potential of −750 to −800 mv. is satisfactory for some dyes, a figure of −1000 mv. is desirable. Increasing the concentration to 12% gives very "safe" conditions, with a time for 50% loss of 5 min. (Table IX), after which the residual Formosul still has considerable reducing power. Equally well we can assume that decomposition due to atmospheric oxidation before steaming, albeit slower, is similarly influenced by the initial concentration.

TABLE X

Effect of Moisture Content of the Print on entering the Steamer on the Decomposition of Formosul during Steaming of the Print

Time of Steaming (min.)	% of Initial Formosul remaining (8% in print paste initially)	
	Not dried before Steaming	Dried before Steaming
1	90·5	82
3	63	56
5	49·7	36·5
8	31·6	24
11	26·5	9·3
15	13·9	5·5
20	7·4	4·4

Moisture content of the print, judged by practical standards, plays a dual rôle, the adverse effect of moisture before steaming having already been discussed. In the steamer, however, the reverse is true, and Table X shows that moisture on the print retards the rate of decomposition of Formosul, probably because there is less condensation of water and therefore less temperature rise[6]. This is a further possible explanation of the success of the pad–steam process for use with dyes not applicable by the normal print–dry–steam process.

CONCLUSIONS

The work so far carried out on the relation between Formosul and the use of vat dyes has emphasised the following points—

(*1*) *Individuality of Dyes*

To obtain maximum fixation, each dye must be considered on its own merits with regard to the concentration of Formosul required. Owing to the rapid rate of decomposition in steam, especially at low concentrations, too low a concentration of Formosul is lost before the dye is reduced; whereas in other cases too high a concentration may bring about over-reduction, with a consequent adverse effect on the shade. It is of considerable advantage to understand these dye characteristics in relation to Formosul when formulating mixtures for printing, where for consistent results the properties of the component dyes should be as similar as possible.

(*2*) *The Shortcomings of Formosul*

Formosul is unstable to conditions often met in printworks practice, e.g. exposure to air and moisture and drying at exceptionally high temperatures. The resultant uncertainty as to the exact concentration on the print precludes its use with dyes which are very sensitive to Formosul concentration, and also renders necessary the uneconomical practice of always using an excessive concentration to avoid the adverse effect of unavoidable decomposition of Formosul during the handling of the prints.

(*3*) *Lack of Knowledge of Steaming Conditions*

A wider knowledge of the effect of traces of oxygen contamination and of the effects of humidity in the steamer, resulting in more reliable methods of steaming, would allow of a more exact control over the printing of vat dyes, greater regularity in the final prints, and less chance of loss due to damaged prints resulting from faulty steaming conditions.

(4) In spite of all these difficulties in the use of Formosul, very large quantities of vat-printed goods are produced, thanks to the ingenuity and careful control exercised in its use by printers. Nevertheless, with increasing steam costs and the demand for shorter steaming times one can visualise— in fact there is already evidence of— a drift towards the use of pad–steam techniques employing a caustic soda–hydrosulphite reducing system and extremely short steaming times.

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(*MS. received 1st March 1956*)

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COMMUNICATION

The Rates of Desorption of Level-dyeing Acid Dyes from Wool

C. H. NICHOLLS

A study of the initial rates of desorption of level-dyeing acid dyes from wool into sodium borate (borax) solution has indicated a linear relationship between the dye removed, expressed as a percentage of the total dye initially present, and the square root of the time. Activation energies of diffusion during desorption from wool have been determined for several dyes.

The effects of method of application of dye, nature of dye, and nature of substrate on rates of desorption of acid dyes from wool have been determined. It is shown that the rate of desorption is controlled by the relative magnitudes of the forces of repulsion between the charged fibre and the dye anion and the forces of attraction, such as van der Waals, hydrogen bonds, etc., between fibre and dye. Any fibre modification which results in an increase in the number of free acidic groups, such as dyeing at low pH values, acid chlorination, or peroxide bleaching, increases the rate of removal of dye by alkaline solution.

Introduction

The fundamental processes of the dyeing of wool with level-dyeing acid dyes have been investigated in great detail. The results of these studies have shown that the rate of adsorption of dye by wool is influenced by the dyeing conditions, in particular the pH and the temperature of the dyebath, the presence of added electrolyte, and also the nature of the dye. The effects of such varying conditions of dyeing on the resistance of dyes to subsequent removal from the fabric by various wet treatments have been little studied.

In his investigations into the fastness of wool dyeings to wet treatments, Goodall[1] studied the effects of pH and temperature of the desorbing medium on the removal of dye from wool. Samples containing dyes of different wet-fastness properties were treated at a particular temperature with 25 vol. of phosphate buffer solutions ranging in pH from 7 to 10·5, and after 30 min. the dye desorbed was measured colorimetrically. He found that increase in pH and increase in temperature both increased the amount of dye desorbed, the effect being more marked in the case of the simple level-dyeing acid dyes than with more complex milling dyes. Further, he showed also that the desorption depends on the nature of the extracting solution, especially in the case of the milling dyes.

According to Vickerstaff[2], Woolvin has studied the rate of desorption of acid dyes from wool at pH 10 and 60°c., and obtained curves of an exponential nature. The amount of dye desorbed at equilibrium shows good correlation with wet fastness.

In both these investigations little attention was paid to the effect of varying the dyeing conditions. That the method of application does in fact affect the wet-fastness properties of acid dyes on wool was noted by Millson *et al.*[3,4] in their microscopical observations of wool dyeing. They found that samples dyed at 65°c. had an inferior wash fastness to those dyed at the boil, and attributed this to the greater penetration of dye into the fibre at the higher temperature. The fastness to rubbing of dyed wool was found to be more dependent on the methods of dyeing than upon the inherent nature of the dye itself; in particular, the milling and chrome dyes were very sensitive to acids and temperature, while level-dyeing acid dyes showed some dependence on pH.

The purpose of the present investigation was to make a detailed study of the initial rates of desorption of acid dyes from wool as affected by method of application, nature of the dye, and nature of the wool substrate. The desorbing medium chosen was 0·05 M. sodium borate (borax), which has a pH approaching that of ordinary washing solutions, but not high enough to cause degradation of the wool at the temperatures used.

Experimental

MATERIALS

Fabric

A 64s merino plain-weave flannel, of weight 6 oz./sq.yd., was used throughout the investigation. Strips 135 cm. long and 15 cm. wide (45 g.) were given a light scour in dilute detergent (Teepol—Shell) solution prior to dyeing.

Dyes

All dyes except Ponceau 6R (FBy) (*C.I.* 186) were batch materials containing no diluents, kindly supplied by Imperial Chemical Industries Ltd., Dyestuffs Division, and were used for dyeing without further purification. Pure samples required for the standard solutions used in calibrating the Spekker absorptiometer were obtained by repeated crystallisation from ethanol in the case of the monobasic dyes, and by repeated salting out from aqueous solution with sodium acetate and subsequent extraction with ethanol in the case of the other dyes.

APPARATUS

Dyeing

Dyeing was carried out in a laboratory-scale winch dyeing machine, with a liquor ratio of 60 : 1. A thermostatic temperature control was incorporated in the apparatus to permit dyeing at temperatures below the boil.

Desorption

The apparatus was similar to that described by Armfield[5]. The desorption vessel was a Pyrex glass tube of approx. 80 ml. capacity fitted by means of a ground glass joint to a short tube which acted as a condenser. Twelve such tubes, in two rows of six, were placed in a frame immersed in a water-bath. This bath maintained the temperature of the desorbing solution to within ± 0·2°c. of

that desired, a bath temperature of 41°C. being required for desorption at 40°C. Dyed flannel samples were agitated in the sodium borate solution by attaching them to one end of a stainless-steel rod, the other end being fastened to a reciprocating bar driven through a gear by a synchronous electric motor. The rate of agitation was controlled by the choice of gearbox, the one used in this work causing the samples to oscillate at 60 cycles/min. through an amplitude of 4·5 cm.

Dye Estimation

The Hilger Spekker photoelectric absorptiometer, together with Ilford Spectrum filters, was used for all dye estimations.

PROCEDURE

Dyeing Methods

In the preliminary experiments dyeing was carried out by the usual mill procedure: the wetted-out material entered the dyebath, which was at 50°C. and the desired pH, the dyebath was raised to the boil in 30 min., and boiling was continued for 1 hr. Although in many cases complete exhaustion of the dyebath was not obtained, the flannel strip was removed, washed well with water, and conditioned at 65% R.H. and 21°C. After cooling to 20°C., the final dyebath pH was measured by means of a Cambridge Instrument Co. glass-electrode pH-meter. When the effect of dyebath pH on the rate of desorption became evident, the procedure was modified in order to maintain a constant dyebath pH. The wetted-out material was initially brought to the pH of the dyebath by immersion for 1 hr. in a buffer solution (hydrochloric acid and potassium hydrogen phthalate) of the same pH.

Desorption Methods

Each conditioned strip of dyed fabric was cut into samples approx. 8 cm. × 5 cm., the weights of which were adjusted to exactly 1·000 g. The amount of dye present initially was ascertained by extracting duplicate samples with 2·5% aqueous pyridine and estimating colorimetrically. In the case of the polybasic dyes, the residual dye after pyridine extraction was removed by subsequent extraction with boiling 0·05 M. sodium borate.

For desorption, duplicate 1·000-g. samples, attached to stainless-steel rods, were agitated in 75 ml. of 0·05 M. sodium borate, maintained at a constant temperature, for specific times. After the solution had been cooled to 20°C. the dye desorbed was estimated colorimetrically, the Spekker absorptiometer having previously been calibrated with standard solutions of purified dye in 0·05 M. sodium borate.

Treatments

(*a*) ALCOHOLIC ALKALI—The flannel was treated in 2% potassium hydroxide in 98% ethanol (20 : 1 liquor ratio) at 25°C. for 20 min., centrifuged, and neutralised with gaseous carbon dioxide. It was then washed with water and neutralised with dilute acetic acid.

(*b*) PEROXIDE BLEACH—Flannel strips were circulated at 45°C. in 2-vol. hydrogen peroxide solution (30 : 1 liquor ratio) containing trisodium phosphate (3 g./litre) for 3 hr. After rinsing in water, each sample was neutralised with dilute acetic acid.

(*c*) BISULPHITE BLEACH—Flannel strips were circulated in a cold solution of sodium metabisulphite (2 g./litre) for 3 hr. and brought to pH 3 with sulphuric acid. After treatment, the fabric was washed well, and neutralised with dilute ammonia.

(*d*) ACID CHLORINATION—A sample was circulated in a cold sodium hypochlorite solution containing 4·5% available chlorine on the weight of wool (liquor ratio 30 : 1) for 45 min. The final pH was 3·5. To remove excess chlorine the fabric was run in a cold solution of sodium bisulphite (2 g./litre) for 10 min., rinsed, and neutralised.

(*e*) ALKALINE CHLORINATION—Flannel strips were wetted out in 1% sodium borate solution, sodium hypochlorite solution (4·5% available chlorine on weight of wool) was added slowly over a period of 10 min., and the fabric was run for a further 30 min. Excess chlorine was removed by treating with sodium bisulphite solution (2 g./litre), and then rinsing and neutralising.

(*f*) EPICHLOROHYDRIN—A flannel strip was treated in a 5% aqueous solution of epichlorohydrin (liquor ratio 30 : 1) at 95°C. for 2 hr. The sample was centrifuged, washed with water, and neutralised with dilute ammonia solution.

(*g*) METHANOL AND ACID—A flannel strip was treated with 0·1 N. hydrochloric acid in methanol (liquor ratio 50 : 1) at room temperature for 6 days. After treatment, the sample was centrifuged, washed well with water, and neutralised with dilute ammonia solution.

(*h*) DIAZOMETHANE—A flannel strip (48 g.) was treated for 48 hr. at room temperature with an ethereal solution (2 litres) of diazomethane formed by the action of 40% potassium hydroxide (60 ml.) on nitrosomethylurea (30 g.). The wool was washed with ether, and treated for a further 48 hr. with a fresh solution of reagent, then centrifuged, and washed with ether, alcohol, and water.

Results and Discussion

PRELIMINARY EXPERIMENTS

In the preliminary experiments, flannel strips were dyed with Orange II (*C.I.* 151) and glacial acetic acid (3% on the weight of wool), the initial and final dyebath pH values being 3·6 and 4·6 respectively. The dye extracted, expressed as a percentage of the total dye initially present, is plotted against t, the time of desorption, in Fig. 1. It is seen that the curve is of an exponential nature. Fig. 2 shows the same desorption values plotted against $\sqrt{t}$. The resultant straight line, the slope of which will be referred to as the *rate of desorption*, is in effect a measure of the rate of diffusion of dye from the fibre into the desorbing solution. The straight line does not pass through the origin but cuts the axis, in this case at $t =$ 1·4 min. This value represents the time taken for

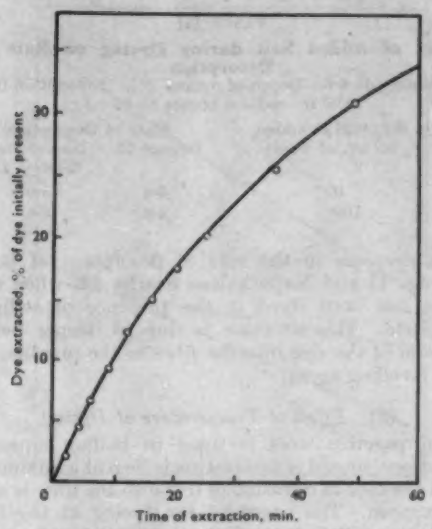

FIG. 1— Rate of Desorption of Orange II from Wool into 0·05 M. Sodium Borate at 40°C.

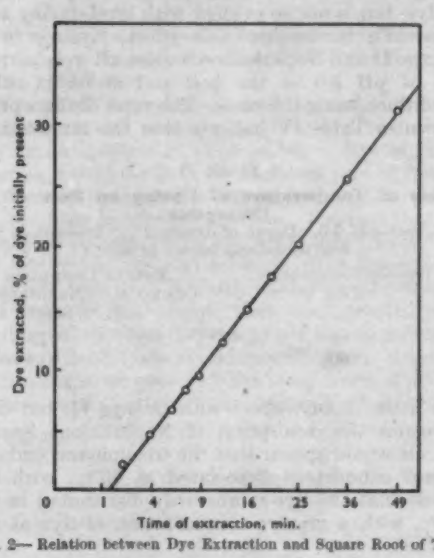

FIG. 2— Relation between Dye Extraction and Square Root of Time

the sodium borate to wet out the material, and depends on the temperature of the solution.

Liquor Ratio

A liquor ratio of 75 : 1, as used in the above experiment, had been initially chosen for convenience. The effect of altering this ratio is shown in Fig. 3, where values obtained for liquor ratios of 25 : 1 and 150 : 1 are superimposed on the graph from Fig. 2. With the former ratio, the normal linear relationship was obtained up to 16% extraction (for a 2·3% depth of dyeing), after which deviation from this line occurred as the equilibrium partition of dye between fibre and desorbing bath was approached. As a result, a liquor ratio of 75 : 1 was chosen for use in all subsequent experiments, so that the rates of desorption

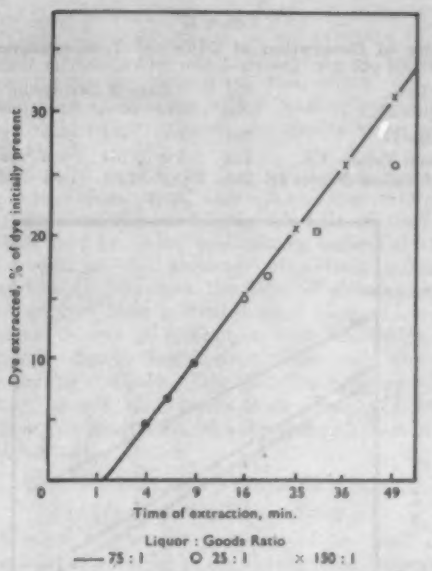

FIG. 3— Effect of Liquor Ratio on Dye Desorption

measured were in fact rates of diffusion of dye from the fibre.

Rate of Agitation

The rate of adsorption of dye by wool is known to be dependent on the rate of agitation of the goods relative to the dye solution. To determine whether there was a similar effect in desorption, the rate of agitation was doubled. The rates of desorption obtained for Orange II, both at 40°C. and at 60°C., were identical for the two speeds, indicating that the rate of agitation is not critical. However, throughout this work a constant rate of agitation was used.

Depth of Dyeing

The rates of desorption of a series of samples dyed with Orange II under identical conditions but at different depths (Table I) indicate that depth has no influence on the rate of desorption.

TABLE I

Rate of Desorption at Various Depths
(Orange II into 0·05 M. sodium borate at 40°C. Dyebath pH 4·6)

Depth of Dyeing (%)	Rate of Desorption
0·56	5·3
1·23	5·4
2·29	5·35
2·62	5·3
3·60	5·35

The reproducibility of the method also is indicated by these results.

Temperature of Desorption

It was found that the rates of desorption of certain dyes increased rapidly with rise in temperature (Table II), indicating the need for stringent temperature control in these experiments.

TABLE II

Rate of Desorption at Different Temperatures
(Dyebath pH 3·0. Desorbed into 0·05 M. sodium borate)

Dye (depth 2%)	C.I. No.	Rate of Desorption 30°C.	40°C.	50°C.	60°C.
Orange II	151	3·4	6·4	10·6	18·5
Metanil Yellow YK ...	138	3·0	5·4	9·5	16·6
Naphthalene Scarlet 4R	185	7·6	12·1	19·4	30·8

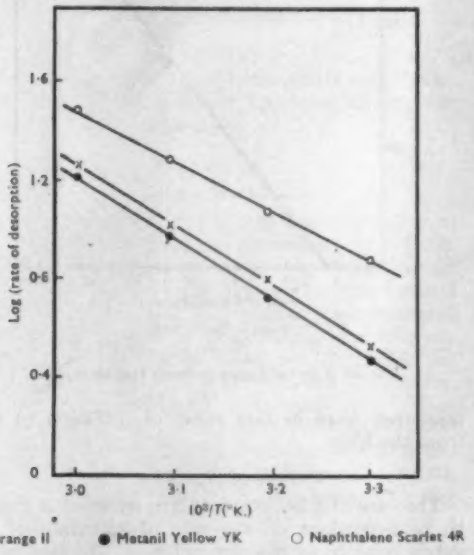

FIG. 4—Effect of Temperature on Rate of Desorption

From values of the rates of desorption at different temperatures given in Table II, the activation energies of desorption were calculated by plotting logarithms of the relative rates of desorption against the reciprocal of the absolute temperature (Fig. 4). The activation energy was 23 kcal./mole for the monobasic dyes Orange II (*C.I.* 151) and Metanil Yellow YK (*C.I.* 138), and 20 kcal./mole for the tribasic dye Naphthalene Scarlet 4R (*C.I.* 185).

THE INFLUENCE OF DYEING CONDITIONS

Dyeing of wool with level-dyeing acid dyes can take place under varying conditions, the optimum conditions being those that give a level dyeing of the required depth of colour in the shortest time with a minimum of materials. The following experiments were designed to determine whether the different dyeing conditions have any influence on the rate of desorption of the dye into alkali.

(*1*) *Effect of Added Electrolyte*

In wool dyeing, sodium sulphate is added to the dyebath as a levelling agent, its function being to decrease the rate of adsorption of the dye anion. To ascertain whether the addition of this salt has any subsequent effect on the rate of desorption, fabrics were dyed with purified dyes, with and without addition of hydrated sodium sulphate (100% on the weight of wool), at a dyebath pH of 4·6, this value being chosen to eliminate the fibre damage which occurs in the presence of salts at low pH values. Table III shows that there

TABLE III

Effect of Added Salt during Dyeing on Rate of Desorption
(Dyebath pH 4·6. Depth of dyeing 2%. Desorption into 0·05 M. sodium borate at 40°C.)

$Na_2SO_4.10H_2O$ added (% on wt. of wool)	Rate of Desorption Orange II	Naphthalene Scarlet 4R
0	5·4	8·0
100	4·6	6·8

is a decrease in the rate of desorption of both Orange II and Naphthalene Scarlet 4R when the wool has been dyed in the presence of sodium sulphate. This decrease is due to deeper penetration of the dye into the fibre in the presence of the levelling agent.

(*2*) *Effect of Temperature of Dyeing*

In practice wool is dyed in boiling aqueous solutions, since dye association is then at a minimum and the rate of diffusion of dye into the fibre is at a maximum. The necessity for dyeing at the boil to give satisfactory fastness properties is well recognised in the case of the more complex types of dye, but is not so evident with level-dyeing acid dyes. To investigate this effect, dyeings with Orange II and Naphthalene Scarlet 4R were carried out at pH 3·0 at the boil and at 65°C., other conditions being the same. The rates of desorption shown in Table IV indicate that the temperature

TABLE IV

Effect of Temperature of Dyeing on Rate of Desorption
(Dyebath pH 3·0. Depth of dyeing 2%. Desorption into 0·05 M. sodium borate at 40°C.)

Dyeing Temperature (°C.)	Rate of Desorption Orange II	Naphthalene Scarlet 4R
65	6·5	15·5
100	6·4	12·1

has little, if any, effect with Orange II, but does influence the desorption of Naphthalene Scarlet 4R. It would appear that the trisulphonic acid dye is not completely dissociated at 65°C., with the result that the dye is unevenly distributed in the fibre, with a greater concentration of dye at the surface.

(*3*) *Effect of Dyebath pH*

Level-dyeing acid dyes can be applied to wool from an acid bath of pH ranging from 1 to 5, although values of 2–3 are most common in practice. Experiments were undertaken with dyes of different basicity to ascertain whether this variation in pH of application has any effect on the subsequent removal of dye by alkali. In each experiment the dyebath pH was kept at a constant value by first bringing the pH of the wool to that of the dyebath. The rate of desorption of dye into sodium borate was then determined as before. The results illustrated in Fig. 5 show a linear relationship between the rate of desorption and the pH of application, the lower the dyebath pH the greater being the rate of desorption. This effect could be due to two causes, fibre degradation

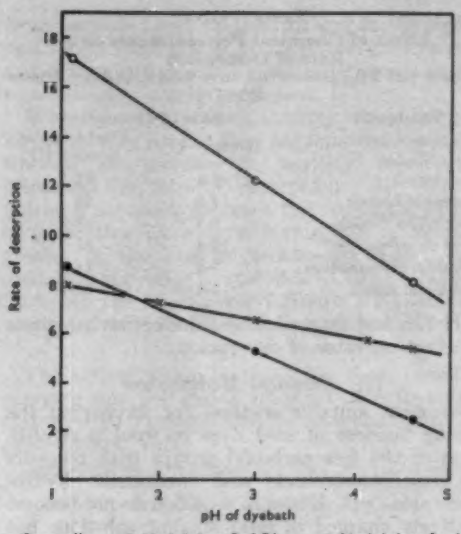

FIG. 5—Relation between pH of Application and Rate of Desorption

in the boiling acid dyebath and less even distribution of dye through the fibre when dyed from the more acid bath.

Chemical degradation, such as peptide bond breakdown and primary amide group hydrolysis, giving an increase in the number of free carboxyl groups, would result in an increased rate of desorption, owing to the greater negative charge developed by the fibre in alkaline solution. The fact that the slopes of the graphs in Fig. 5 are 0·8, 1·7, and 2·7 for the mono-, di- and tri-basic dyes respectively suggests that this is the probable explanation.

Peryman [6] has shown that wool treated with boiling solutions of decreasing pH has an increased alkali solubility and decreased yarn strength, indicating some peptide bond breakdown. Further, Peters and Lister [7] have shown that amide hydrolysis of wool occurs at high temperatures and low pH values, especially in the presence of dye anions or high salt concentrations. A series of experiments to determine the effect on dye desorption of boiling under various conditions was therefore carried out, the results being given in Table V.

Prolonged boiling at low pH values increases the rate of desorption, which in the case of Orange II rises from 8·0 on boiling for 1 hr. to 10·7 on boiling for 3 hr. Also, preliminary boiling at a low pH value in the presence of sodium sulphate considerably increases the rate of desorption of dyes applied from a weakly acid bath. Thus the increase in rate of desorption with decreasing pH is mainly due to degradation of the wool fibres in the boiling dyebath. Dye distribution plays only a very minor rôle, since there is such a small decrease in desorption on subsequent treatment at a higher pH.

INFLUENCE OF THE NATURE OF THE DYE

(1) *Effect of Dye Affinity*

A most important property of an acid dye, especially in relation to its wet-fastness properties, is its affinity for wool. The affinity values of various monobasic acid dyes for wool, determined by several methods, have been summarised by Vickerstaff [8]. Table VI gives the affinity values of four of these dyes at 60°C. together with the corresponding rates of desorption obtained at 40°C. and 60°C. for samples dyed to a 1·5% depth at a dyebath pH of 3·0. As was to be expected for dyes of the same basicity, the higher the affinity for the fibre the slower was found to be the rate of desorption.

(2) *Effect of Dye Basicity*

Since the dyeing properties of level-dyeing acid dyes depend on the number of acid groups in the dye molecule [9,10], it seemed probable that basicity also would affect the desorption of dyes. To investigate this, the rates of desorption were

TABLE V

Effect of Boiling under Various Conditions on Rate of Desorption
(0·05 M. sodium borate at 40°C.)

Dyeing Conditions	Rate of Desorption: Orange II	Rate of Desorption: Naphthalene Scarlet 4R	Amide N (% of total N)
Dyed by boiling for 1 hr. at pH 4·6	5·3	8·0	6·4
Dyed by boiling for 1 hr. at pH 1·1	8·0	17·1	6·0
Dyed by boiling for 2 hr. at pH 1·1	9·6	—	5·6
Dyed by boiling for 3 hr. at pH 1·1	10·7	—	5·3
Dyed by boiling for 1 hr. at pH 1·1, then boiled for 1 hr. at pH 4·6 ...	7·6	16·5	—
Boiled for 1 hr. at pH 1·1 with hydrated sodium sulphate (50% on wt. of wool), then dyed by boiling for 1 hr. at pH 4·6	7·6	16·4	—

TABLE VI

Dependence of Rate of Desorption on Dye Affinity
(Dyebath pH 3·0. Desorption into 0·05 M. sodium borate)

Dye (depth 2%)	C.I. No.	Affinity (at 60°C.) (kcal./mole)	Rate of Desorption 40°C.	Rate of Desorption 60°C.
Orange II	151	4·4	6·4	18·5
Metanil Yellow YK ...	138	5·2	5·4	16·6
Solway Purple R	1073	6·5	3·0	9·1
Solway Ultra Blue B ...	—	7·1	2·0	6·0

ascertained for a series of dyes of similar fundamental structure, but differing in basicity. The rates of desorption into sodium borate solution at 40°C. for samples dyed under the same conditions as in the previous section are given in Table VII.

TABLE VII

Dependence of Rate of Desorption on Dye Basicity
(Dyebath pH 3·0. Desorption into 0·05 M. sodium borate at 40°C.)

Dye (depth 2%)	*C.I.* No.	Basicity	Rate of Desorption
Naphthalene Red J	176	1	1·6
Naphthalene Red EA	182	2	5·2
Naphthalene Scarlet 4R	185	3	12·1
Ponceau 6R	186	4	16·0

The substitution of a sulphonic acid group into the dye molecule reduces the affinity by approx. 1·0 kcal./mole [11]. From Table VI it appears that such a decrease in affinity would result in an increase in the rate of desorption at 40°C. of about 1·6 units. The effect of acid substitution in the dye molecules is therefore considerably greater than can be accounted for by decrease in affinity. This large effect can be explained by the fact that the force of repulsion between the negatively charged fibre and the dye anion in alkaline solution increases with increasing basicity.

EFFECT OF MODIFYING THE WOOL SUBSTRATE

(1) Finishing Processes

The various chemical treatments given to wool goods during processing have, in general, an adverse effect on the wet fastness of the dyed material. The extent of this effect was ascertained by subjecting flannel strips to some of the more common finishing treatments, then dyeing at pH 3·0 with Orange II and Naphthalene Scarlet 4R, and determining the subsequent rate of desorption of dye into borax solution. As shown in Table VIII, the effects due to these treatments vary considerably, although in every case the rate of removal of dye is greater than that for untreated wool. The results obtained for alcoholic alkali pretreatment, where the chemical attack is confined to the surface of the fibres, suggest that surface modification facilitates the removal of dye, in accordance with the views expressed by Lindberg [13]. Surface modification no doubt occurs with the other chemical treatments, but the magnitude of the effect of peroxide bleaching and acid chlorination suggests that other factors must be involved. According to Lemin and Vickerstaff [13], these treatments increase the initial rate of uptake of dye, owing to fibre swelling due to disulphide bond breakdown. Such swelling would increase also the initial rate of removal of dye from the fibre. Further, these reagents are fairly strong oxidising agents, capable of oxidising cystine to cysteic acid [14, 15]. The increase in the number of acidic groups by the formation of cysteic acid causes an increased negative charge on the fibre when immersed in the alkaline solution, and consequently an increased force of repulsion between the fibres and dye anions. Less oxidation takes place with sodium hypochlorite at pH 10 than with chlorine

TABLE VIII

Effect of Chemical Pretreatments on Rate of Desorption
(Dyebath pH 3·0. Desorption into 0·05 M. sodium borate at 40°C.)

Treatment	Rate of Desorption	
	Orange II	Naphthalene Scarlet 4R
Untreated	6·4	12·1
Peroxide bleach ...	12·9	28
Bisulphite bleach ...	8·3	18·2
Acid chlorination ...	10·4	21
Alkaline chlorination ...	7·4	14·5
Alcoholic alkali ...	7·6	15·7

at pH 2 [15], and thus alkaline chlorination has much less effect on rates of desorption.

(2) Chemical Modification

The most suitable method for improving the washing fastness of acid dyes on wool is esterification of the free carboxyl groups with reagents such as diazomethane and methanolic hydrochloric acid [16, 17]. Fibres so modified do not become negatively charged in mild alkaline solutions but behave as does untreated wool in neutral solutions.

TABLE IX

Effect of Esterification of Wool on Rate of Desorption
(Dyebath pH 4·6. Orange II desorbed into 0·05 M. sodium borate at 40°C.)

Treatment	Rate of Desorption
None	5·4
Diazomethane	0·1
Methanol–hydrochloric acid ...	0·3
Epichlorohydrin	0·3

The values obtained for the desorption of Orange II from wool esterified by different reagents prior to dyeing at pH 4·6 are shown in Table IX. The effect of esterification is to reduce the dye desorption to a minimum. Although it is unlikely that all carboxyl groups have been esterified by these treatments, sufficient must have been blocked to reduce the forces of repulsion between dye anion and fibre to a value less than the forces of attraction (van der Waals, hydrogen bonding, etc.) between fibre and dye.

Conclusions

The desorption of level-dyeing acid dyes from wool into 0·05 M. sodium borate can be expressed as a linear relationship between the percentage of dye removed and the square root of time. The slope of this straight line, which is independent of depth of dyeing and rate of agitation of material in the desorbing medium but dependent on the temperature of desorption, is a convenient and accurate measure of the ease of removal of dye from the fibre.

By this means it has been shown that the conditions under which dye is applied to wool can influence its subsequent removal by mild alkaline solutions. The presence of large quantities of electrolyte in the dyebath decreases the subsequent rate of desorption, but dyeing at temperatures below the boil has the reverse effect. A decrease in dyebath pH considerably increases the rate of desorption owing to fibre degradation resulting

from peptide bond breakdown and amide hydrolysis. This method should, therefore, prove a rapid and convenient means of estimating the damage to wool caused by acid treatment.

With dyes of the same basicity, those having a higher affinity for the fibre are removed less easily, whereas an increase in basicity considerably increases the rate of desorption. All chemical finishing processes decrease the resistance of dyes to desorption by sodium borate, the effect being greater in the case of treatments which cause oxidation of cystine to cysteic acid. Any treatment by which the free carboxyl groups are chemically blocked greatly decreases the rate of dye desorption.

* * *

The author wishes to thank Dr. S. J. Leach for carrying out the amide nitrogen determinations, and Miss V. Tomljanovics for assistance with the experimental work.

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(*Received 4th April 1956*)

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CORRESPONDENCE

The Editor does not hold himself responsible for opinions expressed by correspondents

An observation made by I. M. S. Walls in his paper *The Dyeing of Orlon and Orlon Mixtures*[1] calls for further comment. He states in the third paragraph (p. 261): "As with other synthetic fibres, the moisture regain is low . . . and consequently fabrics are quick drying".

I am prompted to ask whether this is, in fact, true, or is it a generality plucked from the "ease-of-care" halo with which advertising has endowed the synthetic fibres? If the statement had been applied to filament fabrics there would be no great argument, but outerwear hosiery appears to call for special consideration, and here we have yarns spun from Orlon staple. It may also be said that, even for this particular type of fabric, it is feasible that drying under industrial conditions is a relatively rapid affair, preceded as it is by efficient mechanical extraction procedures. This does not, however, concern the ultimate consumer, whose drying techniques are relatively primitive, but who, in the fullness of time, will be the final arbiter of the merits of synthetic staple-fibre goods so far as quick drying is concerned.

It is apparent, because of the low regain exhibited, that Orlon will contain very little bound water or pore water[2]. Capillary water, of which substantial quantities may be expected to be present in a knitted staple-fibre fabric, depends to a far less extent on the chemical nature of the fibre. The amount of water retained in this way depends upon the fibre diameter, the fibre shape, the value of the receding fibre–water contact angle, the surface tension of the water, the orientation of the fibres in the fabric, and the force of extraction applied[3, 4]. Coplan[5], in a study of the use of wool and staple fibres of nylon, Orlon, Dacron, and dynel for machine-knit half-hose, indicated that the length of time taken to dry depends primarily upon the amount of water per unit area of fabric left behind for evaporative drying, and that the nature of the fibre substance is a very secondary consideration. The amount of water retained depends on the void volume of the fabric—a structural variable—and the capillarity, which depends on the fibre surface and shape. He found no trend to imply that any of the fibres were any quicker drying than the rest, and suggested that, with the non-absorbent fibres spun in loose twists and knitted in bulky, hairy structures, the actual time taken to dry may be increased because of the more thorough saturation of their total void volume.

Oddly enough, my wife has made similar but less erudite observations regarding Orlon hosiery outerwear and nylon staple children's socks.

This has little to do with the dyeing of Orlon and Orlon mixtures, and I apologise to Dr. Walls for taking him up on what appears to be a simple statement of fact in his introduction. Nevertheless, his observation, which, as I have suggested, could well be a popular generalisation, ought to be substantiated or my criticism confounded in the interests of the consumer and of progress in fibre technology.

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31st July 1956

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Notes

Meetings of Council and Committees
September

Council— 5th

Finance and General Purposes— 5th

Colour Index Editorial Panel— 6th, 14th, and 28th

Publications— 18th

Terms and Definitions— 27th

Diplomas— 5th

Death

We regret to report the loss by death of Dr. T. M. Egger.

Election of Fellows

At the meeting of Council held on 5th September 1956 the following were elected Fellows of the Society—

Jack Shore Ingham
(*Halifax, Yorkshire; Chief Chemist, Marks & Spencer Ltd.*)

Edward Marney
(*Timperley, Cheshire; Sales Representative, Imperial Chemical Industries Ltd. Dyestuffs Division*)

Harold Reginald Sutcliffe
(*Rossendale, Lancashire; Chief Chemist and Development Manager, Mitchells, Ashworth, Stansfield & Co. Ltd.*)

Honorary Secretary
Bradford Junior Branch

Mrs. B. Cope has been elected Honorary Secretary. Her address is 232 Wyke Lane, Wyke, Bradford, Yorkshire.

University of Leeds
Man-made Fibres Division

The new building for the Man-made Fibres Division of the Department of Textile Industries was opened by H.R.H. the Duke of Edinburgh on 29th June 1956. The developments in fibre science and the rapid increase in importance of the regenerated and synthetic-polymer fibres during the past few decades rendered necessary a separate institution devoted to the study of man-made fibres. The project was conceived in 1942, and has finally been brought to reality largely through the generosity of industrial firms. The equipment includes pilot plant for producing the fibres and machinery for making yarns and fabrics and for dyeing, printing, and finishing them. Apart from teaching and research laboratories and two lecture theatres, the building contains a design studio and a dark room for the preparation of screens for screen-printing.

Colleges of Advanced Technology

In the House of Commons on 21st June 1956 the Minister of Education named the following as colleges of advanced technology— Birmingham College of Technology, Bradford Technical College, Cardiff College of Technology and Commerce, Loughborough College of Technology, the Royal Technical College, Salford, and the Battersea, Chelsea, and Northampton Polytechnics in London. Conditions for designation include strong direct representation of industry, and also of universities and professional technological interests.

George Porter Paine
AATCC Executive Secretary

Mr. G. P. Paine has been appointed Executive Secretary of the AATCC, on the retirement of Dr. H. C. Chapin, who has served as Secretary for the past twenty-three years. Mr. R. R. Frey will continue as Assistant Secretary. Mr. Paine has been Assistant Secretary of the American Standards Association.

Chemical Textile Finishes

A course of thirteen weekly lectures will begin on Tuesday, 13th November 1956, at 6.30 p.m., in which experts will deal with most aspects, from formaldehyde and silicones to the machinery required for their application. Full details are obtainable from the Registrar, College of Science and Technology, Manchester 1.

Pakistan Dye Factory

A start has been made at Daudkhel on the construction of the first dyemaking plant in Pakistan. The annual production is to be 250 tons of Congo Red and 300 tons of Sulphur Black.

The Vat Dye Institute (U.S.A.)

A group of dyemakers and chemical firms in the U.S.A. is to form a new trade association, the main purpose of which will be to "increase and expand the consumption of vat dyes by promoting their proper end-uses through advertising and educational programmes".

Canadian Imports of Dyes

The total value of dyes imported into Canada during 1955 was $7,968,221 (6,001,604 lb.), compared with $6,550,872 (5,182,244 lb.) during 1954. The main suppliers were, in million $ (million lb.), the U.S.A. with 4·98 (3·81), Switzerland with 1·35 (0·69), and the United Kingdom with 1·03 (0·98). Smaller imports came from Western Germany, France, the Netherlands, Belgium, Bermuda, and Italy.

Dyeing and Finishing in Canada

Statistical data released by the Dominion Bureau of Statistics in Ottawa, and summarised in *Canadian Textile J.*, 82, 33 (20th April 1956), show

that the gross value of work performed in establishments whose primary occupation is the dyeing and finishing of textile goods (excluding those in which dyeing or finishing plant is ancillary to the main manufacturing operations) rose from $3,517,507 in 1929 to $14,606,604 in 1952. By 1954, the latest year for which data are available, the value had fallen to $11,631,538, of which 81% (37 establishments) refers to Quebec and 19% (16 establishments) to Ontario. The total number of employees in 1954 was 1,940. The major activity was the dyeing and finishing of textile fabrics (60% by value); printing and painting on textile fabrics accounted for 14%; and other activities included dyeing, finishing, and mercerising yarns, rubberising and waterproofing fabrics, bleaching, shrinking, and sponging. The total cost of materials was $3,029,934, the largest item by weight being common salt (3,541,843 lb.). The data for "aniline and other dyes" are given as follows—

	Quantity (lb.)	Cost Value at Plant ($)
Sulphur colours	46,545	56,784
Direct colours	229,344	417,433
Indirect colours	30,948	89,778
Acid or basic colours ...	85,549	129,992
Colours used in printing ...	27,577	106,339
Other colours and dyes ...	63,821	122,602
Total ...	483,784	922,928

The Dyer's Croft, Bradford

In an article in the Bradford *Telegraph & Argus* of 18th June 1956 Mr. Wade Hustwick states that demolition of old property on the triangle of land bounded by Leeds Road, Bridge Street, and Market Street, in the centre of Bradford, will probably lay bare the Dyer's Croft of 600 years ago. About 1355 the Walker family—who had the corn mill and also a fulling mill alongside the Bradford Beck near the present Millergate—took a lease on a plot of land by the pool formed by the confluence of this stream and the Bowling Beck, for which they paid an additional rent of 3s 4d per annum. The Walkers had the monopoly of fulling (milling) and dyeing, and in 1373 Thomas Walker took an extra piece of land, at an annual rent of 6d, for the enlargement of his tintorum (dyehouse). In 1547 another Thomas Walker refused to pay the rent because the Dyer's Croft had been leased to Tempest; and in 1595 the Walkers refused to pay for the monopoly, because the Tempests had it.

Association Internationale de la Teinture Textile

The annual congress of the A.I.T.T. was held this summer near Lucerne. Nine countries (Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Sweden, and Switzerland) are represented in the A.I.T.T., which includes all branches of textile finishing except calico printing, with a labour force of 180,000 and a turnover of about 2,700 million DM. The integration of the European textile market was regarded as an ultimate objective, for which a preliminary need is the preparation of statistical data on a common basis. The technical committee has been concerned with problems of international standardisation, and the A.I.T.T. has been represented at the ISO meetings this year.

International Symposium on Macromolecular Chemistry

An International Symposium, covering polymers, biocolloids, and polyelectrolytes in solution, was held in Israel under the auspices of the Commission on Macromolecules of the International Union of Pure and Applied Chemistry and the Weizmann Institute during 3rd–9th April 1956. Institutions in over twenty countries were represented, and eighty papers were presented, in addition to lectures reviewing recent developments in polymer science. In this short account it is possible only to mention those which may be of particular interest to readers of this *Journal*.

The first section of the symposium was concerned with the general behaviour of polymers in solution, dealing with solution theory, hydrodynamic properties, and the shapes of polymer molecules in solution. The interaction of nylon with solvents was discussed by Valentine (of Leeds) and that of cellulose derivatives with solvents by Moore, Epstein, Brown, and Tidswell (Bradford). Viscosimetric studies carried out at the Weizmann Institute suggest intramolecular hydrogen bonding in polymethacrylic acid. The coacervation of polyamides was considered by Turska (Lodz).

A second section dealt with the behaviour of biocolloids and polyelectrolytes in solution and included studies of polyvinyl derivatives (A. Katchalsky, Rehovot; Alfrey and Pinner, New York) and sodium alginate (Allgen, Stockholm). Studies of aqueous solutions of polypeptides (Berger and Linderstrøm-Lang, Copenhagen; Doty, Harvard; Blout, Boston) suggest a folded form for poly-DL-alanine and a reversible transformation between random coil and helix for poly-L-glutamic acid. A general review of the solution behaviour of poly-α-amino acids was given by E. Katchalsky (Rehovot).

In a third section concerned with special polymeric systems in solution, Usmanov (Tashkent) presented evidence for the biosynthesis of cellulose in cotton by polycondensation. The use of cuprietheylenediamine and cuprammonium hydroxide in the fractionation of cellulose was discussed by Sihtola (Helsinki) and the swelling of regenerated cellulose by Nowakowski (Lodz). Studies on vinyl polymers included the irradiation of polymers in solution (Charlesby and Alexander, Hinxton Hall). The preparation and the properties of graft copolymers and of several nitrogen-containing polymers were also described. All the papers, and discussions, are to be published in a special number of the *Journal of Polymer Science*. W.R.M.

Dicel Cellulose Acetate

The continuous-filament secondary cellulose acetate yarn manufactured by British Celanese Ltd. is now known by the trade-mark *Dicel*.

Polyester Fibres in Germany and Holland

The Farbwerke Hoechst AG. have introduced their *TreVira* polyethylene terephthalate fibre, manufactured under licence from Imperial Chemical Industries Ltd. A similar product manufactured by the Vereinigte Glanzstoff-Fabriken AG. of Wuppertal is *Diolen*. In East Germany polyester fibre is known as *Lanon* (VEB. Thüringisches Kunstfaserwerk "Wilhelm Pieck", Schwarza (Saale)), and in Holland it is *Terlenka* (Algemene Kunstzijde Unie N.V., Emmen).

Synthetic Fibres in the U.S.S.R.

According to *Tekstil. prom.*, **16**, 24–32 (June 1956), the sixth Five-year Plan envisages the production of Anid (6,6-nylon), Lavsan (polyethylene terephthalate), and Nitron (polyacrylonitrile) in the U.S.S.R. on the large scale. At present the only fully synthetic fibres manufactured are Capron (6-nylon) and Khlorin (based on polyvinyl chloride). Enant (7-nylon; see J.S.D.C., **72**, 304 (June 1956)) appears to be still only in the experimental stage. A.E.S.

Creslan Acrylic Fibre

The American Cyanamid Co. announces that pilot-plant quantities of a new acrylic fibre, Creslan, will become available toward the end of this year, and that full-scale marketing will start about the middle of 1958. Possible applications of the new fibre are jersey fabrics, sweaters, blankets, simulated fur fabrics, suitings, and overcoatings. The fibre is claimed to have good dyeing properties, and appears to consist of polymerised acrylonitrile and vinyl acetate.

Darlan Vinylidene Cyanide Fibre

See under "Manufacturers' Publications" (p. 489).

Kylan Deacetylated Chitin

Commercial production of Kylan has started at Spartanburg, South Carolina, the raw material being shrimp shells. It is a polymer of glucosamine and may be regarded as aminocellulose. It may be used for shrink-resisting wool fabrics, as an emulsifying agent and a stabilising agent for cationic emulsions, for the antistatic treatment of textiles, and for spinning from solution into continuous fibres of high strength and good dyeing properties.

New Books and Publications

ASTM Standards on Textile Materials
(with related information)

Prepared by ASTM Committee D–13 on Textile Materials. Pp. xxi + 761. Philadelphia: American Society for Testing Materials. 1956. Price, $5.75.

The latest A.S.T.M. tentative and standard methods of test, specifications, and definitions are given in this book, 22 out of a total of 118 standards being new or having been revised since the previous edition (October 1954). Among subjects covered are humidity testing, analysis, and resistance to insects and micro-organisms.

It is interesting to read that Committee D–13 now consists of 369 members, but its work is assigned to 18 subcommittees, some divided into sections and task groups, making a total of 90 unit groups. C.J.W.H.

Bibliographical Abstracts on Evaluation of Brightening Agents for Detergent Usage
Special Technical Publication No. 177

Prepared by L. E. Weeks. Pp. iii + 9. Philadelphia: American Society for Testing Materials. 1955. Price, $1.50.

Although brighteners were originally— and still are— applied to paper, they were incorporated in detergent compositions about 1945, and the literature on methods of evaluation has steadily grown. This pamphlet contains 37 abstracts covering the years 1943–1955, and it is hoped to keep the bibliography up to date. Subject and author indexes are included. C.J.W.H.

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

Badische Anilin- und Soda-Fabrik AG.

Indanthren Printing Black LF Suprafix Paste— This vat dye gives grey and black prints of very good fastness to light and good fastness to washing and chlorine on cotton and regenerated cellulose. It may be applied by the normal Rongalite C–potash process without pre-reduction and by the Collorein process. It is also of interest on polyamide materials. Fastness figures for a black print on cotton include— Light 7–8, washing "c" 4, chlorine 5.

Ortol Dyes— This card contains dyeings in three depths on wool yarn of four Ortol dyes— Yellow F4G, Scarlet FG, Blue FG, and Green B. They are intended to supplement the Ortolan range of neutral-dyeing metal-complex dyes, which they closely resemble in dyeing properties and fastness characteristics when applied to wool, silk, and polyamide fibres, although they are not metal-complex dyes themselves. Dyeings of twelve combinations of Ortol and Ortolan dyes are included. Fastness figures on wool include—

Ortol Yellow F4G— Light 6, washing "b" (60°C.) 4, alkaline milling "b" 3–4.

Ortol Scarlet FG— Light 5, washing "b" (60°C.) 4, alkaline milling "b" 3–4.

Ortol Blue FG— Light 5–6, washing "b" (60°C.) 2–3, alkaline milling "b" 3.

Ortol Green B— Light 6, washing "b" (60°C.) 3, alkaline milling "b" 3.

ORTOLAN BLACK G SPECIAL—This metal-complex dye gives greys and blacks on wool and polyamide fibres. It is similar to the other members of the Ortolan range, but has been designated "special" because on wool up to 5% of formic acid (85%) is required when dyeing, and if shading is necessary only those members of the range which behave satisfactorily under these conditions should be used. Blacks of excellent fastness to light are obtainable, and in practically all other respects they are equal to those given by the other members of this class. It is particularly recommended for Vigoureux printing, since only 1 hr. steaming is required. Blacks are obtained on polyamide fibres, the recommended procedure being to commence dyeing in a neutral dyebath at 90°C., raise to 130°C. in 10 min., and dye at this temperature for 15 min., exhausting if necessary with 1–2% of formic acid (85%). Fastness figures for a black on wool include—Light 7–8, washing "b" (60°C.) 4, alkaline milling "b" 4–5.

NEKANIL AC SPECIAL IN WOOL DYEING—Nekanil AC Special is recommended—(1) as a levelling agent to be added to the dyebath when dyeing all classes of wool dyes except the Ortolan, Neopalatin, and similar types; (2) for levelling material previously dyed unevenly; and (3) for stripping, levelling and stripping of chrome dyes being possible without destroying the dye–metal complex. Patterns are included showing the effect of the product for levelling and stripping dyeings of Basolan and Basolan Chrome dyes.

PERSTABILISER BASF—A salt of a polycarboxylic acid recommended as a stabiliser for alkaline peroxide bleach baths. In addition to controlling the decomposition of the peroxide, it inhibits the catalytic action of traces of metals or metal salts which may be present either in the material or in the bleach liquor.

ULTRAPHOR APL—A fluorescent brightening agent recommended for use on cellulose acetate, polyamide, polyester, and polyacrylonitrile fibres, to which it is applied from aqueous dispersions in the same manner as a disperse dye.

THE USE OF LEVELLING AGENTS IN WOOL DYEING—A reprint of an article by B. Hartmark published in the *Veredlerjahrbuch–Deutscher Färberkalender 1955*, p. 105.

LIMITS OF DYEING: THE DYER AND HIS CLIENT—Reprints of two papers by G. Schwen, the first from *Melliand Textilberichte*, **36**, 581 (1955), and the second from *Zeitschrift für die gesamte Textilindustrie*, **57**, 844 (1955).

Courtaulds Ltd.

COURPLETA—This booklet (56 pp.) gives a comprehensive account of the nature, properties, and uses of this cellulose triacetate fibre. It includes a short account of its dyeing characteristics and some notes on the behaviour of mixtures of it with secondary cellulose acetate, Fibro, and wool.

COURLENE X3—The properties of this new type of polyethylene monofil are given in an interim data sheet and compared with those of standard Courlene. The new material possesses most of the useful properties of the latter but has a higher softening point (120°C. against 90°C.) and melting point (135°C.), and is more stable at comparable temperatures. Unlike the standard type it can be used for fabrics required to be stable to boiling water. Clear monofil and white monofil are available, and spun-dyed yarn will shortly be available as Courlene–Duracol X3.

J. R. Geigy S.A.

CUPROPHENYL YELLOW 3GL—This direct dye gives quite bright yellows of good fastness to light and wet treatments when applied to all types of cellulosic fibres and aftertreated on the fibre with copper sulphate. It is very suitable for use on materials subsequently to be crease-resisted and for dyeing wool–cellulosic fibre mixtures. Fastness figures for an aftercoppered dyeing on cotton include—Light 6–7, washing (Test B) 4–5, perspiration 4–5.

POLAR GREEN 2BDE—This weak-acid-dyeing dye gives bluish greens of very good fastness to light and wet treatments on all forms of wool and nylon and mixtures of these two fibres, and it is of particular interest for producing medium to heavy dyeings. It exhausts well under neutral conditions on to the wool component of wool–cellulosic fibre mixtures, viscose rayon being left white and cotton only slightly tinted. Fastness figures on wool include—Light 4–5, washing (S.D.C. Test No. 2) 4–5, perspiration (S.D.C. Test) 4–5.

UNION FAST SL DYES: WOOL–STAPLE FIBRE 50 : 50—This is an enlarged version of Pattern Card No. 0958a, *Union Fast SL Dyes*. It contains dyeings in six depths on a 50 : 50 wool–viscose rayon staple fibre mixture cloth of fifteen dyes, including four new members of the Union Fast SL range—Yellow GSL, Rubine SL, Violet SL, and Green GSL. Pale to medium dyeings have good fastness to water and perspiration; deep dyeings can be considerably improved in this respect by aftertreatment with Tinofix LW, although the fastness to light is thereby reduced by 0·5–1·0 grade. They have excellent levelling and penetrating properties, and even at the boil wool is dyed less deeply than the cellulosic fibre, which makes possible a degree of control exceptional with dyes of this type. Dyeings in three depths of 30 mixtures are also included, together with 26 dyeings on wool yarn of suitable shading dyes.

B. F. Goodrich Chemical Co.

DARLAN—This pamphlet (*Service Bulletin* D–1) describes the physical, chemical, and dyeing properties of a new synthetic fibre based on vinylidene dicyanide $CH_2{:}C(CN)_2$. It is a very soft fibre of medium strength (1·5–1·75 g./denier) and very good elasticity. It is similar to the polyacrylonitrile fibres in dyeing behaviour. Pale dyeings are best produced with disperse dyes, and heavy dyeings with either disperse dyes and a carrier, basic dyes, or azoic combinations. It has a limited affinity for certain vat, solubilised vat, and acid dyes, the last-named when applied by the cuprous ion method. It cannot be dyed with acid dyes by conventional methods nor with direct, metal-complex, or chrome dyes.

Imperial Chemical Industries Ltd.

TECHNICAL INFORMATION LEAFLETS—*Dyehouse No. 287. Mélange (Vigoureux) Printing of "Terylene" Polyester Fibre*—A typical recipe is given for a medium grey on sliver after gilling when printing with 50% coverage using Dispersol Fast Orange B 300, Duranol Red X3B 200, and Duranol Printing Blue G 200. Nafka Crystal Gum Supra and Cellofas B (medium viscosity) are recommended as thickenings; steaming for 3 hr. at 5 lb./sq.in. is adequate. The necessity for thorough washing-off is stressed, and it is suggested that samples taken at regular intervals of a run should be submitted to the perspiration fastness test as a control.

Dyehouse No. 292. Clean-to-handle Copy Carbon Papers: Spot Test to determine Suitability of Copy Paper—A selection test based on the reaction between Methasol Copying Blue B and the aluminium salts in the copy paper is described.

Dyehouse No. 293. Alcian "X" Dyes: Control of Fixation Bath in Printing—The usage per hour of sodium or potassium dichromate when employed for eliminating unfixed Alcian dye after steaming has been determined, and tables are provided from which the amount required for replenishment may be calculated for a wide range of operating conditions.

Dyehouse No. 300 (replaces No. 250). *Subject Index to Technical Information Leaflets (Dyehouse) No. 161–299.*

Dyehouse No. 301. Mélange (Vigoureux) Printing of "Terylene" Polyester Fibre: A Process for printing Azoic Blacks—A recipe is given for a medium grey on sliver after gilling, applied with 50% coverage, based on Dispersol Diazo Black B and Brenthol OT. The process is of value only where steaming of the printed sliver can be carried out at 125°C. or above, i.e. at 20 lb./sq.in. or above.

Dyehouse No. 302. The Light Fastness of Pigments in Printing Ink Media—The fastness to light of all the ranges described in the pattern card *Colours for Printing Inks* has been determined using films of ink prepared by grinding the pigment into thin lithographic varnish with aluminium hydroxide as extender where specified. Films corresponding to the stronger masstone, standard depth, and weaker undertone have been tested using the second of the two methods described in *B.S.* 1006. Part 1: 1955 and fading to the specified degree on Standard 7. The B.S.I. scale is recommended instead of the older madder

scale, the use of which has never been developed systematically and has declined in value in recent years.

Dyehouse No. 303. A New Approach to the Dyeing of "Terylene" Polyester Fibre, Secondary Acetate Rayon and Triacetate Rayon: The "Vapocol" Process— Disperse dyes are rapidly absorbed by these fibres on exposing material impregnated with them to saturated vapours of trichloroethylene or other chlorinated hydrocarbons for 15 sec.–5 min. at 80–90°C. The most convenient procedure is to pad the cloth with a mixture of disperse dye, thickener, and wetting agent, dry, and expose to trichloroethylene vapour. The trichloroethylene may be readily removed from the fabric by immersing it in either boiling water (Terylene and triacetate) or water at 80°C. (secondary acetate) for 30 sec. Times of fixation for a range of disperse dyes on secondary acetate and triacetate are given, and five dyes are particularly recommended for Terylene. On the latter the percentage dye fixation is similar to that obtained by a normal dyeing process using Tumescal OP as carrier. On secondary and triacetate complete penetration and full colour value are obtained in the times quoted. The fastness characteristics and physical properties of the dyeings are comparable with those of conventionally dyed materials. The use of this technique on a continuous basis is suggested, and further work is being undertaken on these lines.

Dyehouse No. 304. The Dyeing of Viscose Rayon–Cellulose Triacetate Unions: The Fastness of Direct Dyes to Steam Pleating— The properties which must be possessed by direct dyes used for the viscose rayon portion of such unions are stated, and the conclusions drawn from an investigation of the behaviour of those direct dyes considered to be of potential interest are set out. Fastness figures for dry steam pleating of straight dyeings and soaped and unsoaped crease-resisted dyeings are given.

Dyehouse No. 306. Fixanol PN for improving the Perspiration Fastness of Chrome Dyes on Mordant Chrome Gloving Leather— Data are given for the fastness to perspiration (alkaline perspiration test (unneutralised pattern), Test 1) of untreated dyed leather and dyed leather treated with 6% of Fixanol PN in a fresh bath at 60°C. for 20 min.

Dyehouse No. 307. Discharge Effects on Full-chrome Grain Leather— A suitable discharge solution and a method of using it are described, and dyes are listed which on full-chrome leather are completely dischargeable, partially dischargeable, and relatively unaffected under the conditions prescribed.

Dyehouse No. 311. Bundesmann Test for Water Repellency: Revised Tentative Standard.

Dyehouse No. 312. Colours for Building and Decorative Paints: British Standard 2660 : 1955— Suggested recipes are given in groups corresponding to the cards numbered 0–9 in *B.S.* 2660.

Dyehouse No. 315. The Dyeing of "Acrilan"— Supplement No. 1. Selection of Disperse Dyes for the Production of Mode Shades— Dispersol Fast Yellow GR, Duranol Red XB, and Duranol Blue G are recommended. They are compatible in dyeing behaviour, give dyeings of good fastness to light and wet treatments, and fade on tone.

Dyehouse No. 316. Fixanol PN for improving the Perspiration Fastness of Ultralan Dyes on Vegetable-tanned Lining Leather and Chrome-tanned Upper Leather— A method of use is described, and fastness data for treated and untreated dyeings are given.

Dyehouse No. 317. The Dyeing of "Terylene" Polyester Fibre— Supplement No. 3. Selection of Disperse Dyes (replaces No. 239)— Eight dyes particularly recommended for use in combination on 100% Terylene are listed.

Dyehouse No. 318. The Dyeing of "Terylene" Polyester Fibre–Wool Blended Materials— Supplement No. 1— A general dyeing method is described which gives dyeings of fastness superior to those obtained by earlier methods (see *T.I.* (*Dyehouse*) No. 231). In addition, the risk of "carrier-stains" is considerably reduced by adding the carrier (emulsified *o*-phenylphenol) gradually to the boiling dyebath and thus reducing the risk of "cracking" the carrier emulsion, which produces this type of stain. Selections of recommended disperse dyes for the Terylene and acid-milling, chrome, Verilan, and Propolan dyes for the wool are given.

Dyehouse No. 322. Selection of Dyes and Dyeing Methods for Carbonised Woollen Pieces— Details of the Peel test (J.S.D.C., **59**, 5 (1943)) are given, and a preferred dyeing method is described. There is no pre-rinsing or neutralising, wetting-out is carried out at 40–50°C. for 15 min., the temperature of the dyebath is raised to boiling point during 45 min., and dyeing at the boil is restricted to the minimum in order to prevent the development of any carbonising fault inherent in the goods. Groups of dyes are given arranged in order of decreasing efficiency in covering a given degree of carbonising damage, and notes are included on stripping and re-dyeing faulty pieces.

Rubber No. 37. Extended Cellular Butyl Rubber.

Rubber No. 38. The Bonding of "Terylene" Polyester Fibre to Rubbers.

Rubber No. 39. Bonding of "Terylene" Polyester Fibre to Polyvinyl Chloride.

Rubber No. 40. Nonol WSL as an Antioxidant for Neoprene.

M.C.S.D. No. 9. The Use of Melgan A in Cement Mortars.

Lubrol E— This is a non-ionic surface-active agent based on the condensation of an alkylphenol with ethylene oxide. It has been introduced to meet the demand for a non-ionic product similar in performance to Lissapol NX but superior in appearance and physical properties. It can replace the latter on an equal-weight basis in any application where its physical form makes it more suitable.

Durazol Olive G— This homogeneous direct dye gives olive drabs of very good fastness to light on cotton and is particularly recommended, alone and in mixtures, for dyeing gaberdines, cords, and pile cloths. It is also of interest on viscose rayon, but is not recommended for dyeing material subsequently to be crease-resisted. It is of little interest for direct printing. Dyed grounds are not dischargeable. Fastness figures on cotton include— Light 6, perspiration 3, washing (Test No. 2, once at 55°C.) 3.

Caledon Grey 2RC— This vat dye gives bluish greys on cellulosic fibres. It may be applied by all the conventional methods for this class of dye and is the most level-dyeing grey in the Caledon range, being taken up comparatively slowly and having good migrating properties. It may also be applied to cloth by pigment padding and to yarn packages by pre-pigmentation. Dyeings have excellent fastness to light and wet treatments. It is not satisfactory for dyeing cotton–viscose rayon mixtures, since the latter is dyed much bluer than the cotton. It is of no interest for textile printing. Fastness figures on cotton include— Light 7, soda boiling 4, hypochlorite 4.

Duranol Dark Blue TG— This disperse dye gives dull blues to navies on Terylene and is recommended for dyeing all forms alone and in mixtures with cellulosic fibres. Dyeings have good fastness to light and fade on tone, being superior in this respect to dark blues based on the normal three-colour combinations. The preferred dyeing temp. is 120–130°C. without a carrier. It may be dyed at 100°C. using Tumescal D or OP but not Tumescal PH. It is only of very limited interest for dyeing nylon and secondary cellulose acetate and is not recommended for printing. Fastness figures on Terylene include— Light 6 (dyed at 120–130°C.), pleating (steam) 4–5, perspiration 5.

Duranol Grey TN— This disperse dye is similar to Duranol Dark Blue TG and is recommended instead of the conventional three-colour combinations of disperse dyes for neutral greys of good fastness to light, washing, and heat treatments on Terylene and Terylene–cellulosic fibre mixtures. As with the Dark Blue TG brand, the preferred dyeing temperature is 120–130°C. Dyeing can be carried out at 100°C. using carriers, but the dyeings obtained have slightly inferior fastness to light. Fastness figures on Terylene include— Light 6 (dyed at 120–130°C.), washing (Test No. 2, once at 55°C.) 5, pleating (steam) 5.

Solochromate Fast Yellow R— This chrome dye may be applied to wool by all three methods, but is particularly suitable for dyeing by the chromate method, to give reddish yellows of excellent fastness to light even in pale dyeings. It is of particular interest for mode colours on loose wool and slubbing. Ardil protein fibre may be dyed by the same methods as for wool. It may be applied to silk by the afterchrome or alum mordant processes and to nylon by the afterchrome process, giving dyeings of good fastness to light and washing on the latter. It is of some interest for direct printing on wool as a mordant dye and on nylon as an acid dye. Dyeings on silk are

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Wool Protecting Agents

Dyed in the presence of 3% LEVANA —boiled for one hour

Dyed without LEVANA —boiled for one hour

LEVANA

Protects the wool fibres, obviating felting and keeps colours bright even during prolonged boiling.
Especially suitable when re-dyeing off shade lots.
Has excellent levelling properties in the dyeing of wool.

LANASAN CL

Has excellent fibre protecting qualities when dyeing or processing wool under either acid or alkaline conditions.

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Inns and the Textile Trade

No. 7. *'The Bridge on Wool,' Wadebridge, Cornwall.*

Nearly everything in Cornwall has a story. The sign of "The Bridge on Wool" is no exception. The tale goes back to Wadebridge in the Middle Ages when a ferry was the only means of crossing the River Camel at a particular point. The crossing was perilous and many a traveller died in the wily currents.

Distressed by the accidents and drownings, a local vicar, Thomas Lovibond, devoted his energies to raising funds for a bridge.

Work on the bridge began. But the river bed, soft and sandy, swallowed up the slim, stone piers. After months of wasted effort, the dispirited Lovibond was about to abandon the venture when he had a dream.

An angel appeared with a flock of sheep and a pair of shears. As Lovibond clipped the sheep, their wool fell into the river in solid packs.

And so it came to pass, in 1485, a bridge was erected on foundations of bulky wool packs. It is still to be seen, close by the inn which bears its name—the finest example of its kind in England and a picturesque reminder of the days when wool was the supreme trade in this country.

Wool still is one of our greatest national assets. But in today's highly competitive markets the cloth is not judged, or bought, on wool quality alone. It must withstand wear and tear under increasingly exacting conditions. Giving the cloth the necessary properties often involves chemical treatments. The basic chemicals for this important work are the products of firms like Brotherton.

Brotherton

One of the world's largest manufacturers of hydrosulphites, liquid sulphur dioxide and hexamine.
Makers of an extensive range of Metachrome dyes for dyeing wool in all its forms.
Brotherton & Co. Ltd., P.O. Box 6, Leeds, 1. Telephone: Leeds 2-9321. Telegrams: 'Brotherton, Leeds'

Fastness, courtesy of "SEVRON"*

DU PONT "SEVRON" DYES are tailor-made for acrylic fibres. You will find a wide range of shades in the "Sevron" colours, as well as an insurance of good light- and wash-fastness with acrylic fibres or blends. You can apply them directly to top, stock, yarn and piece goods without using the copper method. Look into the level-dyeing "Sevron" family of fine dyes. Contact Brown & Forth Ltd, Clifton House, 83-117 Euston Road, London N.W.1, or E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Dept., Export Div., Wilmington 98, Del., U.S.A.

*Trade Mark

DU PONT Dyes

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BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

1/352

Maureen is fond of this dress which makes all men fond of Maureen.

The material has the soft lustre of natural silk and all the attractive features of a fine cotton fabric. It has been Schreiner finished with FIXAPRET CP LIQUID.

Schreiner Finish

with FIXAPRET CP LIQUID of BASF is fast to washing and dry cleaning. The light fastness of direct colours is not merely unaffected by FIXAPRET CP LIQUID but, in many cases, is even improved.

For technical details see our circular which will be supplied on request.

Badische Anilin- & Soda-Fabrik A.G.
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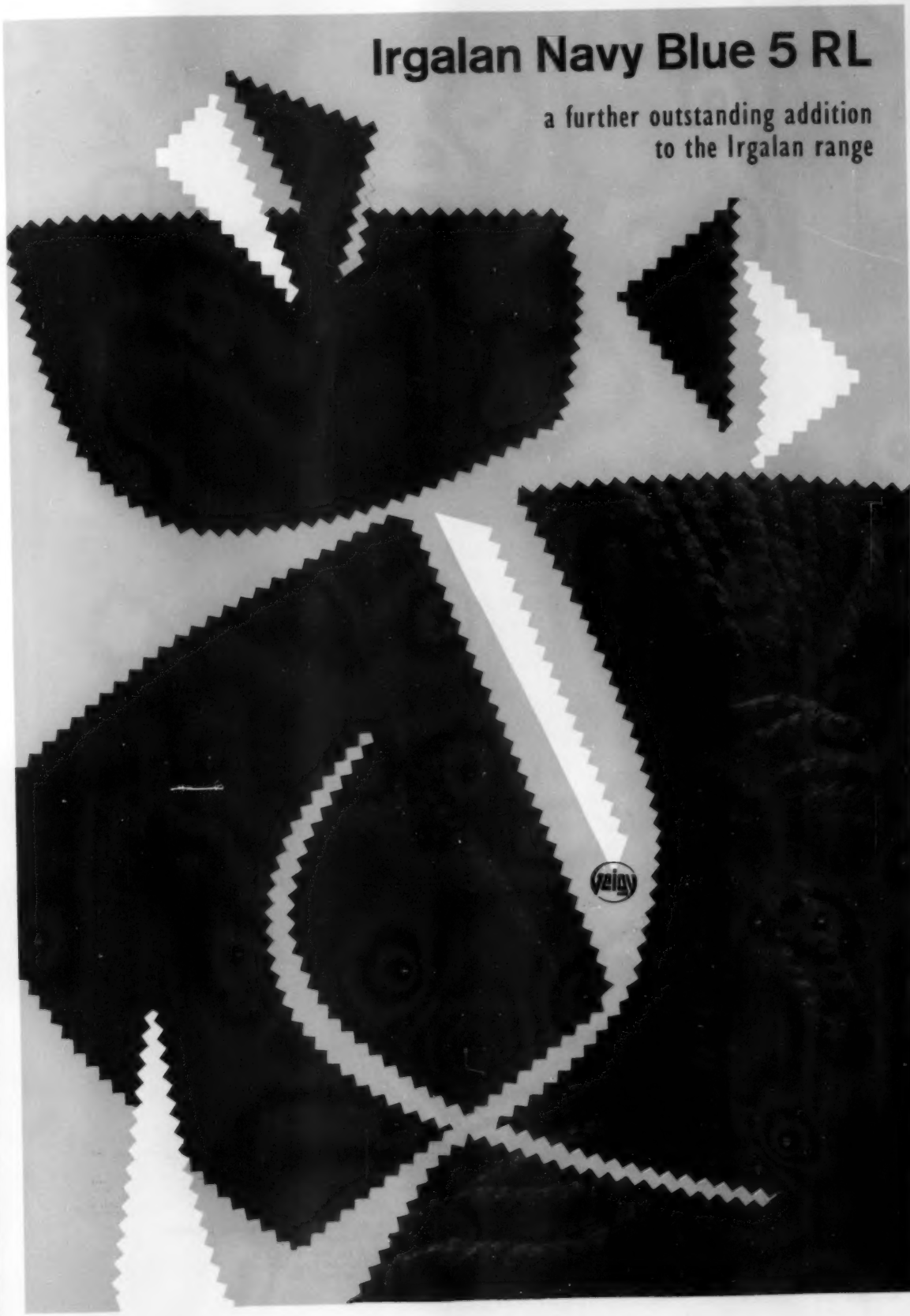
Irgalan Navy Blue 5 RL
a further outstanding addition
to the Irgalan range
Geigy

The first true pre-metallised navy blue

Irgalan Navy Blue 5RL is a true metal complex dyestuff with quite remarkable light fastness. It gives full, bloomy shades on wool and silk, which may be shaded with Irgalan Blue GL, Irganol Blue BS or Irganol Green BLS.

This colour further enhances the range of Irgalan dyes which has found favour in so many fields, owing to its outstanding fastness properties, the excellent tinctorial behaviour and the short dyeing time.

For further information see Circular No. 1257.

Fastness Properties			Wool	Silk
Light	1		N:7	6-7
	2		7-8	7
Washing, test a	effect on shade		4-5	4
	staining	W	5	
		C	5	5
		S		4
Severe Milling	effect on shade		5	
	staining	W, C	5	
Water	effect on shade		5	5
		W	5	
	staining	C	5	5
		S		5
Sea Water	effect on shade		5	5
		W	5	
	staining	C	5	5
		S		5
Perspiration	effect on shade		4	4
		W	5	
	staining	C	5	5
		S		4
Alkali	soda 10 : 1		4	4-5
Acid	acetic 30%	wet	5	
		dry	5	
Decatising	22 lb. p. sq. in.		5	
	36.75 lb. p. sq. in.		5	
Carbonising	neutralised		5	
	not neutralised		4-5	

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A 40

Chlorantine Fast Navy Blue BRLL

Chlorantine Fast Navy Blue RLL

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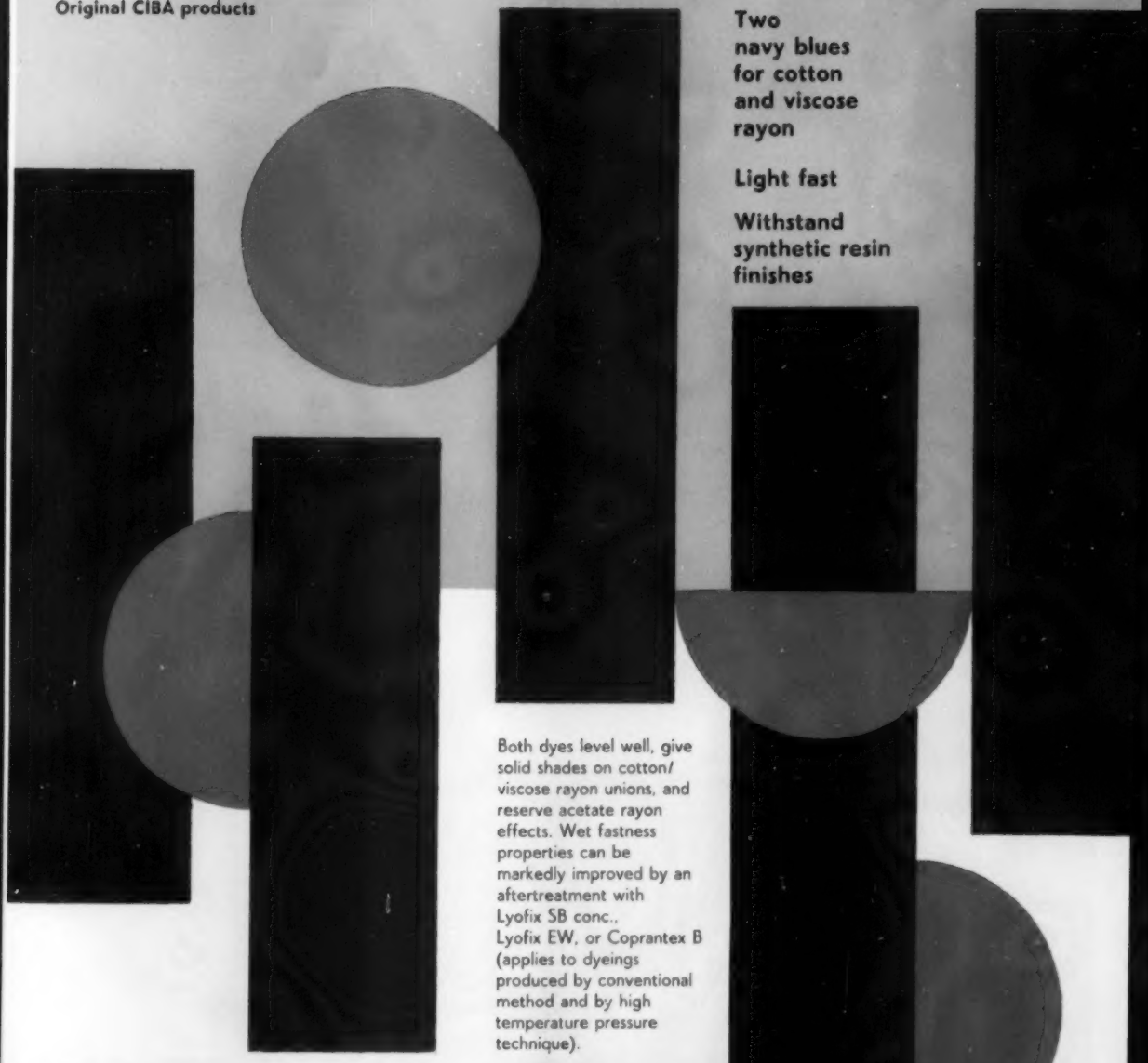

Two navy blues for cotton and viscose rayon

Light fast

Withstand synthetic resin finishes

Both dyes level well, give solid shades on cotton/viscose rayon unions, and reserve acetate rayon effects. Wet fastness properties can be markedly improved by an aftertreatment with Lyofix SB conc., Lyofix EW, or Coprantex B (applies to dyeings produced by conventional method and by high temperature pressure technique).

Chlorantine Fast Navy Blue BRLL and Chlorantine Fast Navy Blue RLL, the navy blues for light-fast furnishings and fabrics to be treated with synthetic resin

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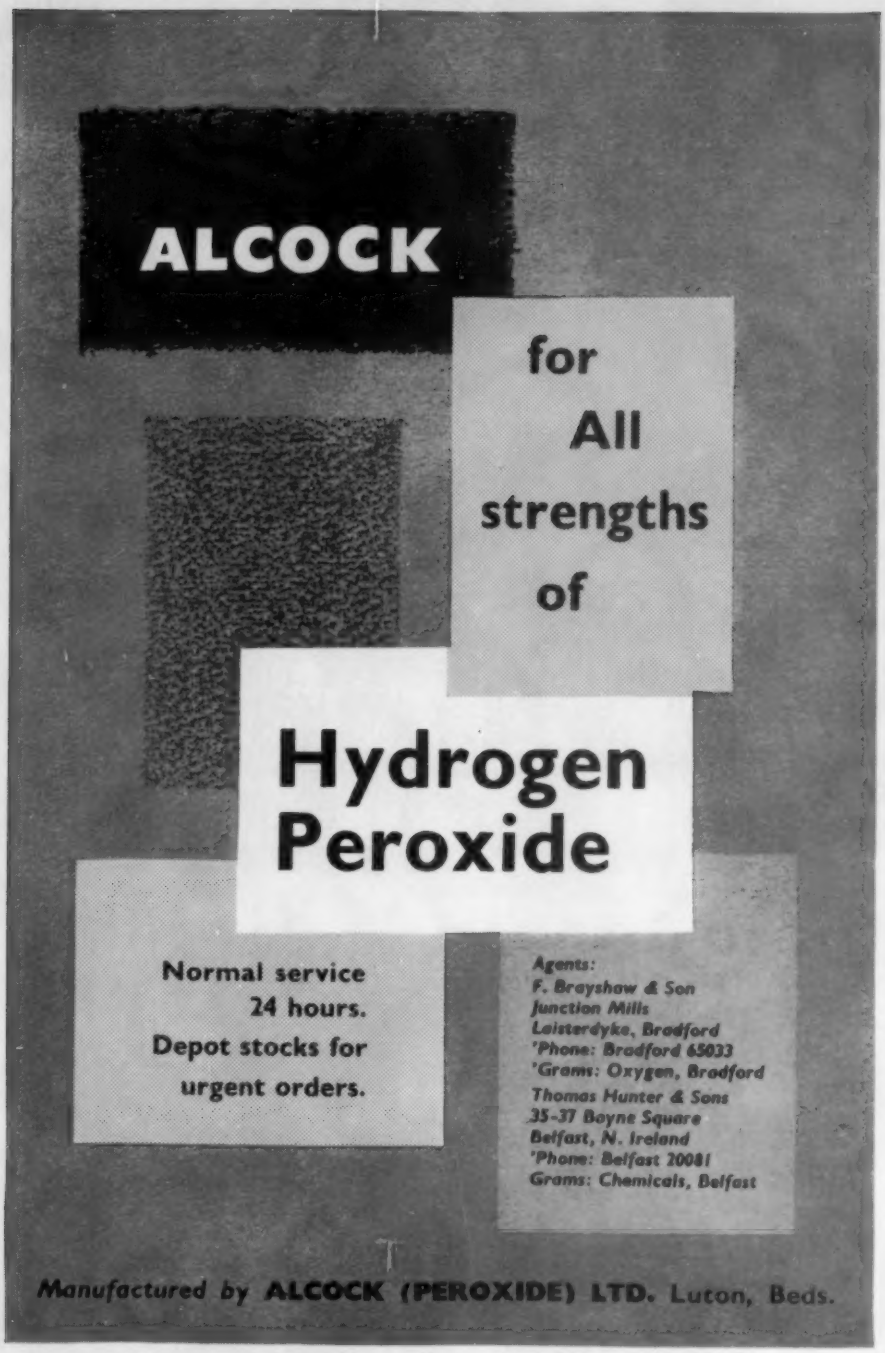
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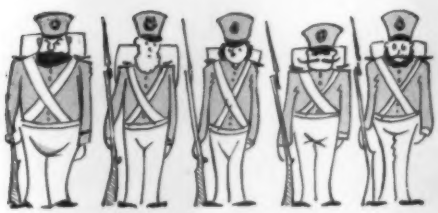
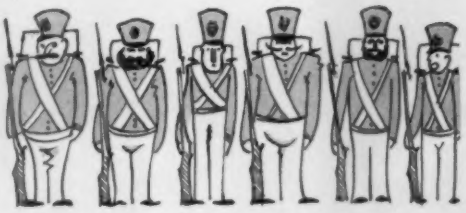
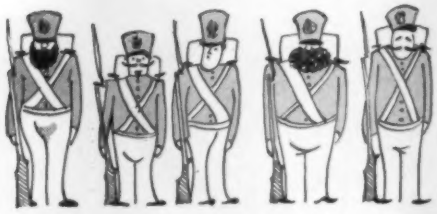
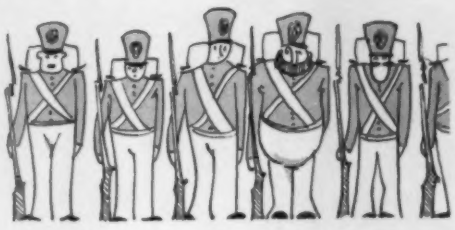



Nervanase & Gelatase

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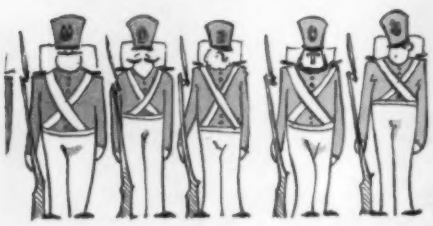
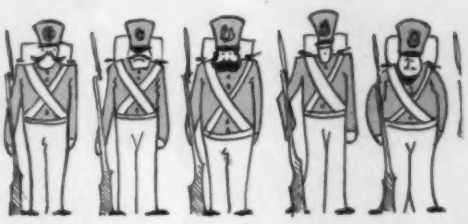
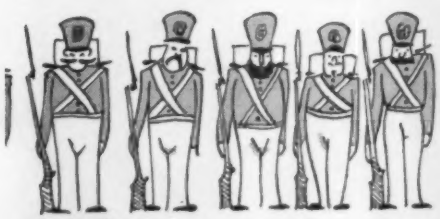
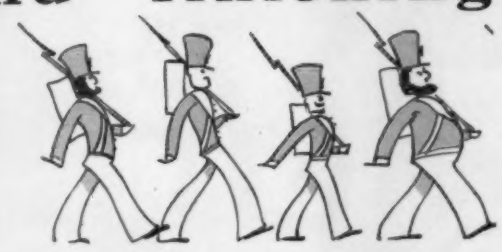



de-sizing and finishing

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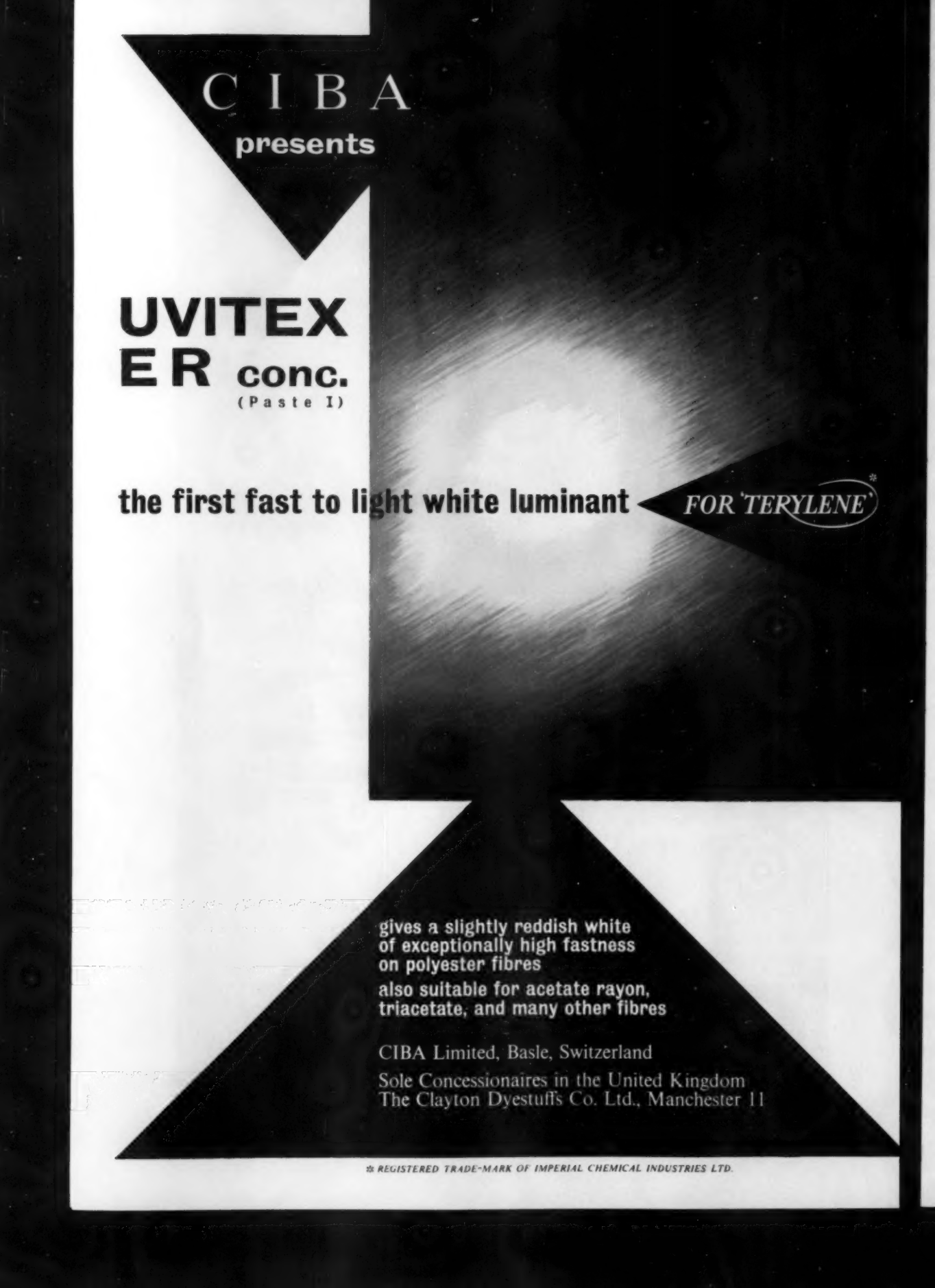
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Important Announcement

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Honorary Treasurer A WADDINGTON A.R.A.A
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Editor and Technical Officer C J W HOOPER PH.D B.SC A.R.C.S
General Secretary J W NICHOLLS B.C.S.S

DEAN HOUSE 19 PICCADILLY BRADFORD 1 YORKSHIRE

Telephone 25138-9

22 October 1956

Dear Sirs

I have been instructed to inform you of the proposals for publishing the SECOND EDITION OF THE COLOUR INDEX which is nearing completion, and to express regret for the delay in publication.

The work is in FOUR VOLUMES and is being published by the Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists.

There have been unforeseen delays in course of preparation, but publication will commence with the delivery of the FIRST VOLUME before the end of this year. VOLUME TWO, if not despatched at the same time, will follow soon afterwards. This to be followed by VOLUME THREE and finally VOLUME FOUR to be published in the early part of 1957.

I am
Yours faithfully

(John W. Nicholls)
GENERAL SECRETARY

To Subscribers

New Colour Index

NEW COLOUR INDEX

Produced by

THE SOCIETY OF DYERS AND COLOURISTS

and

THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

The SECOND EDITION has been completely re-designed and brought up-to-date with the world-wide co-operation of dye and pigment makers.

There are THREE PARTS. In PARTS ONE and TWO the colouring matters are classified according to their usage and constitutions respectively.

PART THREE consists principally of a general index.

THE ENLARGED WORK IS IN FOUR VOLUMES
(*Part 1 is in 2 volumes, Part 2 in 1 volume and Part 3 in 1 volume*)

Please write to the General Secretary for full particulars

VOLUME 1 WILL BE

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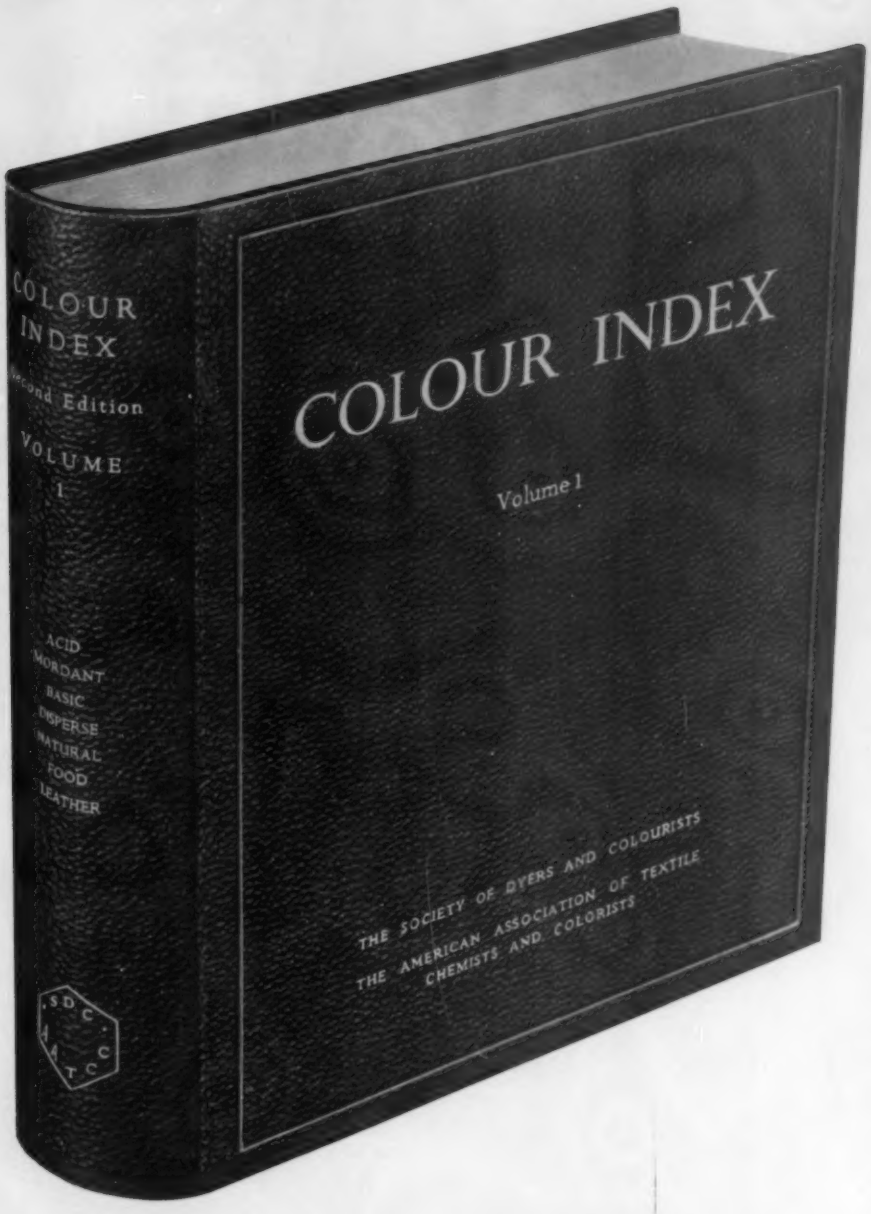


E READY THIS YEAR

NEW COLOUR INDEX

Foreword by the Presidents

THE first edition of the *Colour Index* was published in 1924. Quickly it became recognised as the standard work on the subject in the English language. Shortly before the Second World War the Society of Dyers and Colourists was planning the preparation of a new edition of the *Index* as many of the dyes listed in it had become obsolete and many new dyes— indeed complete new ranges of dyes— had been introduced since the original publication. The outbreak of the war interrupted these plans and the work could not recommence until 1945.

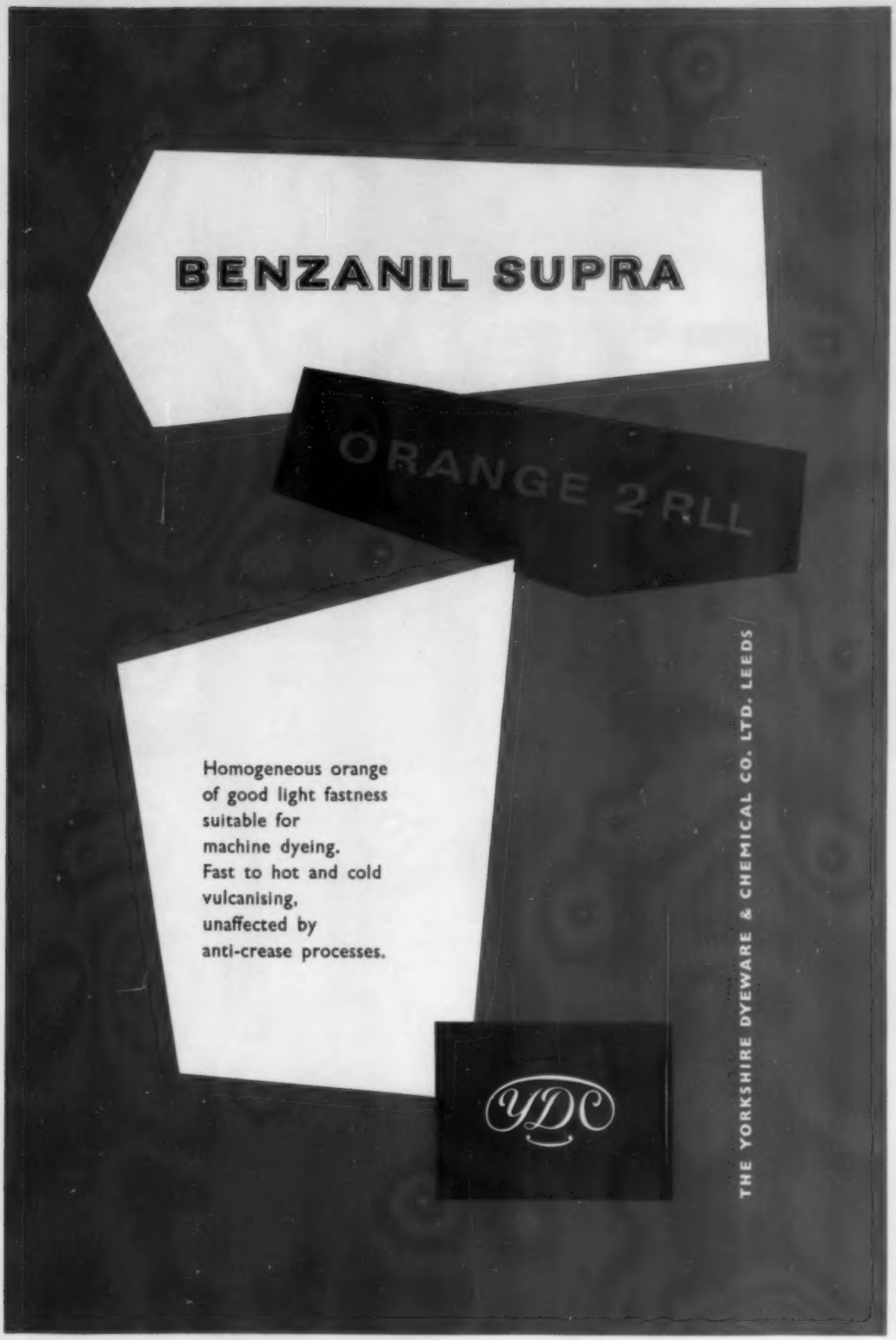
A *Colour Index* Editorial Panel was set up in 1945 by the Society of Dyers and Colourists and at the same time the American Association of Textile Chemists and Colorists was invited to collaborate in the preparation of the new edition. The two organisations agreed that the work of compiling the new *Index* should be a joint undertaking. In view of the information received from users of the original *Index*, it was decided that it would be advantageous to re-cast it in an entirely new form and to include much more information than was contained in the first edition. Every dyemaker in the world was invited to supply information for the new edition. Many firms collaborated in this way and we acknowledge their help with gratitude. The task of the Editorial Panels proved to be much greater than was anticipated originally and has required of them and their helpers a very great amount of detailed and tedious work. Perhaps it is appropriate that their task should have been completed in the year which marks the centenary of Perkin's discovery of Mauve.

As Presidents of the Society of Dyers and Colourists and of the American Association of Textile Chemists and Colorists we should like to express our thanks to the Editorial Panels and to all who have collaborated with them in the production of these new volumes. We feel sure that future users of the new *Index* will have good reason to add their thanks.

It is recognised that any work of reference will tend to become out of date and it is the intention of the Society and the Association to keep the *Index* up to date by the issue of supplementary volumes as occasion demands.

CLIFFORD PAINE
President, The Society of Dyers and Colourists

RAYMOND W JACOBY
President, American Association of Textile Chemists and Colorists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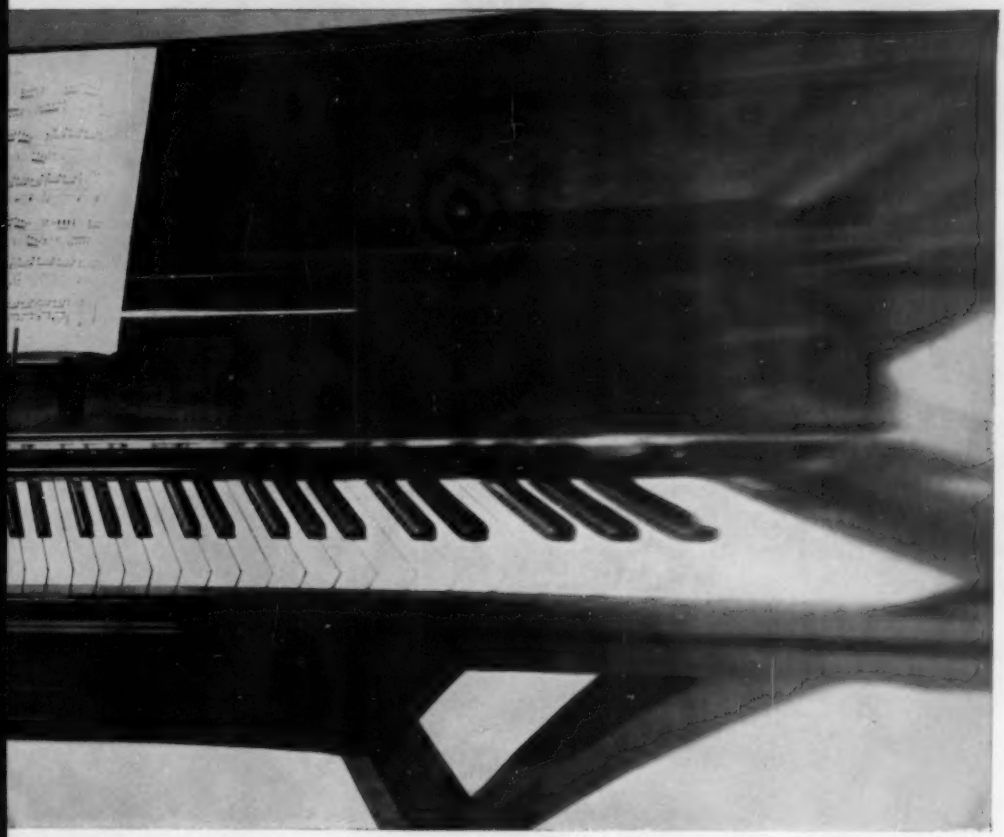

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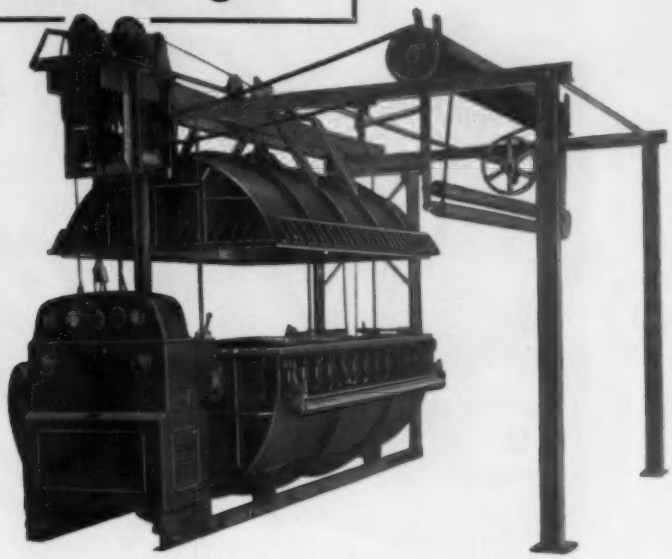

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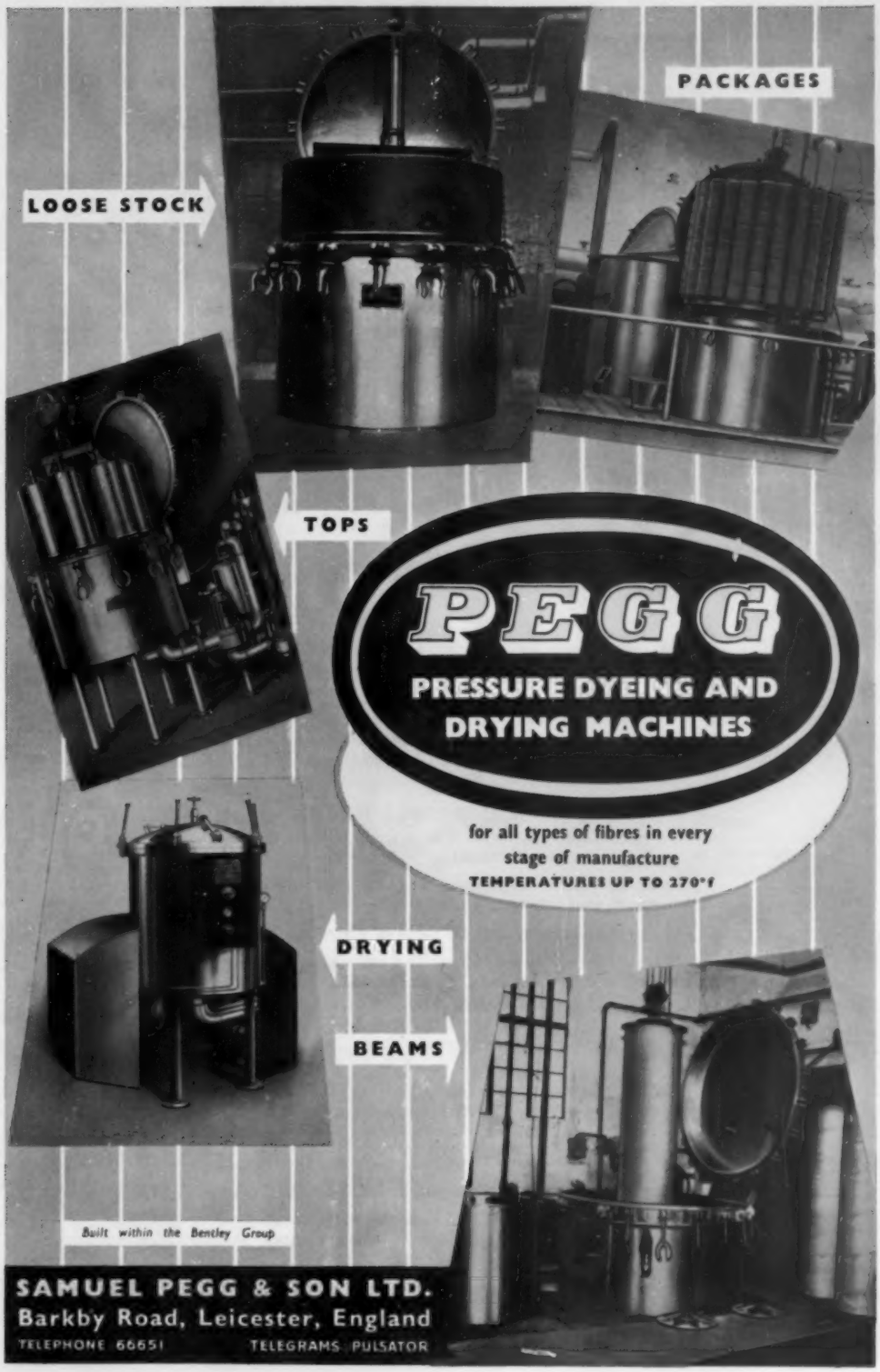
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Owing to mixed crystal formation of the two salts during the manufacturing process, the dangers involved by storage and use are materially decreased.

Demonstration: Place several grams of our product between two sheets of moist filter paper and press tightly together between the palms of the hands and note.

Sodium chlorite »Hoechst« feels cold, ordinary sodium chlorite warm.

Additional use of Bleaching Auxiliary HV, a new auxiliary for bleaching with Sodium Chlorite »Hoechst«, offers the following valuable features:

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2. Reduction of chlorite consumption
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Sodium Chlorite »Hoechst« as well as the simultaneous use of sodium chlorite and sodium nitrate are protected by UK Patent No. 696 967 of 3rd July, 1953.

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suitable for both white and coloured discharges, but only coloured discharges are recommended on wool. Fastness figures on wool dyed by the chromate process include—Light 6–7, alkaline milling 4–5, potting 3.

DYES FOR KRAFT PAPERS—The following dyeings on Kraft wrapping and cable papers are shown—(1) basic dyes (alone and in combination with Naphthalene Orange GS); (2) direct and acid dyes; (3) cable papers dyed with (*a*) basic dyes, (*b*) direct dyes, and (*c*) Fixanol PN and acid dyes.

PARALAC 10E—An aqueous emulsion of Paralac 10, a long-oil linseed-modified alkyd resin containing pentaerythritol, recommended as a medium for durable, rapid-drying decorative enamels.

VULCAFOR ZMBT—A vulcanisation accelerator very similar in nature and behaviour to mercaptobenzothiazole.

SYNTHETIC RESINS FOR SURFACE COATINGS—PAMPHLET NO. 4. DRYING-OIL-MODIFIED ALKYD RESINS—This pamphlet describes the properties and the uses of the various Paralac and Bedesol resins.

STUDIES OF THE DYEING OF NYLON WITH ACID DYES. I—MEASUREMENT OF AFFINITY AND THE MECHANISM OF DYEING—A reprint of a paper by E. Atherton, D. A. Downey, and R. H. Peters (*Text. Research J.*, **25**, 977 (Dec. 1955)).

THE USE OF THE CONTRAST RATIO IN THE MEASUREMENT OF HIDING POWER—A reprint of a paper by D. Tough (*J. Oil Col. Chem. Assocn.*, **39**, 169 (March 1956)).

Maifoss Ltd.

THE MAIFOSS PROCESS—This card contains twenty dyeings on knitted cloth and sixteen on yarn showing something of the scope of the Maifoss process whereby "heather-mixture" effects may be obtained by exploiting the potential differences in dyeing behaviour between different qualities of wool and different portions of the same wool fibre, using a single-bath dyeing method.

Sandoz Products Ltd.

ELFUGINE—This pamphlet gives details of the properties and the application of three antistatic agents expressly designed for use on polyamide, polyester, and polyacrylonitrile fibres. Elfugine SG is a water-soluble non-ionic product which also softens the material; the SG conc. brand is oil-soluble. Elfugine V is a liquid non-ionic product which does not alter the handle. Elfugine UW is cationic and both prevents static and produces a soft handle resistant to washing in neutral detergent solutions or soap solution below 40°C.

OMBROPHOB C—This is a water-soluble cationic product giving durable water-repellent finishes on all textile materials, leather, and paper. It is marketed as a green alcoholic solution with an acid reaction. The active agent is substantive to the materials for which it is recommended and may be applied either from dilute solution or by padding, the water-repellent effect obtained having good resistance to washing and dry cleaning.

SANDOTHRENE PRINTING BLACK TL ULTRAFIX PASTE—This vat dye is particularly recommended for producing greys and blacks on cotton and viscose rayon furnishing fabrics. It may be applied by the potassium carbonate–Hydrosulphite RFN process and by the wet-developing, pad–steam method. Fastness figures on viscose rayon include—Light 6–7, washing 5, chlorine 5.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952) and also, together with symbols and the periodicals abstracted, in the annual index*

I—PLANT; MACHINERY; BUILDINGS

PATENTS

Making Hard Carbon Black Pellets

Godfrey L. Cabot *USP* 2,719,779
Columbian Carbon Co. *BP* 754,124

Continuous Aftertreatment of Freshly Spun Rayon

Ing. A. Maurer *BP* 754,084

The filaments pass through several tubular conduits, a particular liquor being passed in continuous cycle through each conduit. The outlet of each conduit can be closed or throttled to divert the liquor temporarily through a branch port for the initial discharge of the filaments from one set of conduits into the next set of conduits. C.O.C.

Wet Processing of Threads

Courtaulds *BP* 753,540

The thread or threads are propelled into and through the bath with the aid of a jet of liquid projected along the surface of the bath in the direction of travel of the threads. This enables the threads to be passed through the bath under minimum tension. C.O.C.

Coating for Chlorite Bleaching Apparatus

Deutsche Gold- und Silber-Scheideanstalt vormals Roessler *BP* 751,709

Coating the apparatus with an acrylic or methacrylic polymer or copolymer, e.g. Plexiglas, confers good resistance to attack by acid chlorite or chlorine dioxide solutions. C.O.C.

Milling and Scouring Machine

L. P. Hemmer *BP* 753,798

The spout of the machine is placed lower than the rollers. A reciprocating pusher forces the fabric through the spout. C.O.C.

Continuous Fabric-scouring Machine

Riggs & Lombard *USP* 2,718,773

The cloth in rope form passes through a series of tanks the first ones of which contain detergent liquor and the later ones rinsing water. The tanks are all at the same level. The liquor level in each tank is separately controlled and may be the same or different from that in other tanks. The liquor is pumped from each tank into the tank preceding it, so that the fabric and liquor pass in opposite directions. C.O.C.

Pressure Dyeing Machine

Établissements Callebaut-de Blicquy *BP* 753,676

Apparatus comprising a hermetically sealed dye vat, a hermetically sealed tank acting as expansion and/or storage vat, and a pump. Suitable pipes and valves are provided so that the bath can be set in the tank, the material to be dyed placed in the vat, which is then sealed, and the liquor circulated continuously from the tank, through the material, and back to the tank. Where more than one liquor is used and it is desired to preserve them, an auxiliary storage tank may be provided. C.O.C.

Obtaining Samples from Pressure Dyeing Machines

Sir James Farmer Norton & Co. *BP* 753,335

A device incorporating a sliding tube the end of which cuts samples out of the fabric being dyed is mounted in the wall of the pressure vessel. A valve outside the vessel enables the samples to be ejected by pressure in the vessel or either pneumatically or hydraulically. C.O.C.

Winding Cloth, Paper, etc.

E. H. Monkley *BP* 753,907

Means to increase the torque on the driving shaft of the roll during winding without causing sudden change in the tension in the cloth being wound on to the roll. C.O.C.

Selvedge Feeler

W. W. Spooner *BP* 753,481

Cloth fed to a tenter passes two selvedge uncurlers relatively close together. A bar or rod placed between them engages the other surface of the cloth and imparts tension to the cloth. A feeler is placed so as to press lightly against the selvedge and so that it can be displaced by the cloth in a direction transverse to the direction in which the cloth is

passing. By this means, the feeler senses the true edge of the cloth as opposed to its effective edge. C.O.C.

Drying Cloth, Paper, etc.
B. F. H. Mellbin *BP* 753,438

In a drier into which the cloth is fed without tension and without supporting rolls, being supported solely by the streams of drying medium, fluttering or creasing of the cloth (with consequent disturbance in the flow of the drying medium and so uneven drying and/or displacement of the cloth) is prevented by placing on both sides of each nozzle a screen wall which runs along the whole width of the nozzle and projects further towards the cloth than the nozzle. This forms a space around the nozzle in which increased pressure is caused if the cloth comes too near the walls, which pressure forces the cloth back to its normal position. C.O.C.

Multicolour Textile-printing Machines
VEB Textilmaschinenbau Zittau *BP* 752,025

Each impression cylinder is mounted so that it can be moved normal to its axis toward the printing rollers, each printing roller being mounted so that it can rotate or move along its axis but cannot move normal to its axis. Such a machine gives better prints and obviates the danger of accidents possible when both impression and printing rollers can move normal to their axes. C.O.C.

Metal Printing Screens
Rothschilds Continuation *BP* 752,090

A metal stencil is first formed on a temporary support, preferably of metal, by forming a resist image on the support and depositing metal foil on the parts bare of image. A layer of solder is then applied to the free face of the foil, the resist is removed and a metal screen is soldered to the solder-faced coating of the foil, after which the support is removed. Preferably both foil and solder are applied electrolytically. C.O.C.

Conveyor Band for Screen Printing Machines
M. Staffel *BP* 751,689

An endless conveyor band is made up of several endless, thin steel bands and an assembling layer of uniform thickness irremovably joined to the inside of the bands. This layer extends right across the conveyor band and has a modulus of elasticity (at least as regards flexion in the longitudinal direction) much less than that of the steel bands. Providing one or more of the steel bands with magnetic control signals of the type used for sound-recording tapes fulfils the task of a control tape responsible for repeatedly starting and stopping the band-driving mechanism, so that the fabric is always brought into correct printing register. C.O.C.

Observing Superposed Impressions on a Moving Web
National Laboratories & Manufacturing Corpn. *BP* 754,026

Successive repeats of the design (which may be of one or more colours) are observed in mirrors mounted on a rotating member driven by a Selsyn motor. A second Selsyn motor electrically connected to the first motor is rotated in synchronisation with the movement of the fabric, causing the first motor also to rotate in synchronisation with the travel of the fabric. A differential Selsyn motor is electrically connected between the other two motors to change the phase of the first Selsyn motor in a predetermined manner with respect to the phase of the second motor and so change the position of the mirrors with respect to the fabric. C.O.C.

Laundry Press
Brown & Green *BP* 752,951

Drying and Steaming Hats
M. Cassé *BP* 753,946

A machine which treats several hats at once. The operator remains in one position and has to make few movements. C.O.C.

II—WATER AND EFFLUENTS

PATENT

Separating Sludge, Suspensions, or the like as Flocculent Precipitates
Stockholms Benmjolsfabriks AB. *BP* 752,578

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Solubility of Non-ionic Emulsifiers
W. N. Maclay
J. Colloid Sci., **11**, 272–285 (June 1956)

The effects of detergents, electrolytes and organic liquids on the cloud point of a non-ionic emulsifier of the alkylphenol–polyethylene oxide type are described. The lowering of the cloud point in aqueous solution by electrolyte is a linear function of ionic strength. The salting-out effect for alkali-metal and multivalent cations is roughly in the order of increasing ion hydration. Non-polar liquids and anionic detergents raise the cloud point. As the polarity of the organic solubilisate is increased, the increase in cloud point is less marked. W.R.M.

Aluminium Tri-soaps
A. Gilmour, A. Jobling, and S. M. Nelson
J.C.S., 1972–1976 (July 1956)

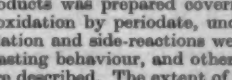
Properties of Periodate-oxidised Starch
J. W. Sloan, B. T. Hofreiter, R. L. Mellies, and I. A. Wolff
Ind. Eng. Chem., **48**, 1165–1172 (July 1956)

A series of products was prepared covering the entire range of starch oxidation by periodate, under conditions such that degradation and side-reactions were minimised. The solubility, pasting behaviour, and other properties of these products are described. The extent of oxidation can be estimated rapidly by measurement of the specific optical rotation. When periodate-oxidised starch is subjected to heat and pressure, a hard, semi-transparent plastic is formed. Preliminary studies on the conditions of preparation of this plastic and its properties are reported. For use in thickening applications, starch should not be oxidised more than 5%; but for moulding, highly oxidised products are preferred. W.K.R.

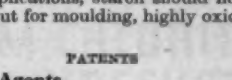
PATENTS

Surface-active Agents
Universal Oil Products Co. *BP* 752,554

Compounds of formula—



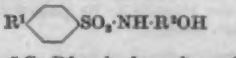
(A = mononuclear aromatic or hydroaromatic radical; R^1 = H or CH_3; R^2 = Alk of 9–15 C; f^1 and f^2 = same or different whole numbers and together = 16–20) are non-ionic or slightly cationic surface-active agents in aqueous solution. The quaternary ammonium salt derivatives of formula—



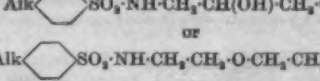
(R^3 = H or Alk or aralkyl of 1–20 C; X = anion) are cationic surface-active agents. C.O.C.

Detergent
Boehme Fettchemie *BP* 753,848

The water-soluble salts of sulphuric esters of water-insoluble alkylbenzene-*N*-hydroxyalkylsulphonamides of formula—



(R^1 = Alk of > 5 C; R^2 = hydrocarbon of > 1 C, may contain one or more OH groups and, in some cases, be interrupted by one or more O atoms), e.g.—



are detergents compatible with electrolytes and anionic, non-ionic or cationic agents. C.O.C.

Textile Lubricants
Shell Research *BP* 753,749

A lubricant which is readily removed during scouring consists mainly of mineral oil with small amounts of an oil-soluble naphthasulphonate, an oil-soluble non-ionic

emulsifier, an oil-soluble water-insoluble nitrogenous emulsifier and 1–5% by weight of water. Such a mixture is particularly suitable for application to viscose rayon or nylon. C.O.C.

Carbohydrate Materials
Corn Product Refining Co. *BP* 750,035

Carbohydrate materials useful as adhesives, thickening agents or colloid stabilisers are produced by dehydrating a starch conversion liquor of D.E. value 5–40 (% of reducing sugar calculated as dextrose, dry basis), and heating with 2% formaldehyde at < 200°C. and pH 1·5–4·5 to polymerise components of the product. W.G.C.

Dispersion stable to Electrolytes
Boehme Fettchemie *BP* 753,668

Aqueous emulsions and dispersions in which water-soluble derivatives of polyalkylene oxide waxes of mol.wt. 5,000–10,000 are used as dispersing agents have considerable resistance to electrolytes. The wax derivative contains at least one aliphatic, *cyclo*aliphatic, aliphatic–*cyclo*-aliphatic, or aliphatic–aromatic hydrocarbon radical of > 3 C directly or indirectly linked to the terminal C atom of the wax through O, S or N. Thus a paraffin wax emulsion which can be diluted with water and is very stable to electrolytes is obtained by using as dispersing agent the stearic monoester of an ethylene oxide wax of mol.wt. 10,000. C.O.C.

Water-repellent Finishing Agent—Size for Glass Fibres
Midland Silicones *BP* 752,371

Vinyltriacetoxysilane yields aqueous solutions which are stable for a long time. It may be used from aqueous or organic-solvent solution to impart a water-repellent finish to textiles, masonry, etc., or for sizing glass fibres. The only by-product is acetic acid, which is readily removed. C.O.C.

Water-soluble Organosilicon Compositions—Water-repellent Agents
Midland Silicones *BP* 751,992

One or more organosilicon compounds of formula—

$$R^1_nH_mSi(OR^2)_{4-n-m}$$

(R^1 = monovalent hydrocarbon of < 7 C; $R^2 = CH_3$ or C_2H_5; n averages 1–2; m averages 0–1; $n + m$ averages < 2) are heated with water at 75–105°C. and pH 5–8 until a homogeneous solution is obtained. The products are stable to storing and are insoluble in hydrocarbons but soluble in polar solvents. They have various uses, e.g. for rendering textiles, ceramics and glass water-repellent, as release agents, as sizes for glass fibres, or for treating hair to prevent it kinking or to prolong the life of permanent waving. C.O.C.

Pure Stable Alkali Cellulose Xanthate
Société de la Viscose Suisse *BP* 752,341

A product suitable as a size, finish or adhesive is obtained by extruding viscose into a coagulant, washing the resulting filaments with a volatile organic liquid which is at least partly miscible with water, e.g. diethyl ether, and drying first for a short period in a current of warm air and then at reduced pressure in presence of a dehydrating agent. The product is readily brought into aqueous or alkaline solution. Such a solution can be applied to cloth and the cellulose regenerated to yield a durable coating which is fast to washing. C.O.C.

Compositions for reducing Keratin
Procter & Gamble Co. *USP* 2,719,813–5

Addition to mercaptan solutions of the corresponding disulphides retards excessive action of the mercaptans on keratin without unfavourably affecting their reducing action. Thus effective hair waving lotions consist of mixtures of thioglycerol and dithioglycerol, mercaptoethanol and diethanol disulphide or thioglycollic acid and dithiodiglycollic acid. C.O.C.

Non-gelling Solutions of Acrylonitrile Polymers and Copolymers
Vereinigte Glanzstoff-Fabriken *BP* 752,703

Non-gelling solutions are obtained by use as solvent of a mixture of glycollonitrile and 5–30% by wt. on the mixture of a compound of formula—

$$CH_3{\cdot}[CH_2]_n{\cdot}CO{\cdot}O{\cdot}CH_2{\cdot}O{\cdot}CO{\cdot}[CH_2]_n{\cdot}CH_3$$

(n = 0, 1 or 2), e.g. methylene glycol diacetate. C.O.C.

Solutions of Polymerised Chlorotrifluoroethylene
FH *BP* 753,660

1:1:2:2-Tetrachloro-3:3:4:4-tetrafluoro*cyclo*butane (b.p. 132°C.) alone or mixed with an aliphatic compound or a mono- or bicyclic aromatic, monocyclic heterocyclic or mono- or bicyclic hydroaromatic compound, e.g. *p*-xylene, dissolves polymerised chlorotrifluoroethylene at 80°C. The solutions are stable above 75°C. C.O.C.

Tanning Agents
FBy *BP* 752,875

Modification of *BP* 747,092 (*J.S.D.C.*, **72**, 366 (July 1956)). The products are obtained as a solid by carrying out the condensation in a saturated solution of a nitrate or a halide of an alkali metal, the anion being the same as that of the nitrogenous base used and one which yields a water-soluble salt with the resulting condensate. C.O.C.

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Dye Research and Application
W. Jenny
Ciba Review, (115), 41–47 (June 1956)

An outline of the development of dye chemistry during 1856–1956. C.O.C.

Use of Deactivated Charcoals for the Isolation of Aromatic Substances
A. Asatoor and C. E. Dalgliesh
J.C.S., 2291–2299 (July 1956)

Charcoal, deactivated by pretreatment with various long-chain aliphatic cpd., selectively adsorbs aromatic substances from aq. soln., allowing a simple separation from aliphatic and inorganic contaminants (even if in large excess). Aromatic adsorbates are displaced from deactivated charcoals by aq. phenol, which is subsequently removed from the soln. by steam-distillation. With stearic acid as deactivating agent, the method is applicable to benzene deriv., pyrroles, pyridine deriv., indoles, purines, and pyrimidines, but not to glyoxalines. With aq. phenol as eluant, and charcoal deactivated with stearic acid, octadecane, or paraffin wax as adsorbent, there is only low recovery of substances with basic amino groups, though high recoveries can be obtained with acidic phenol as eluant. Basic substances can be readily displaced by aq. phenol, however, from charcoal deactivated with octadecylamine. Alumina is a specific adsorbent for *ortho*-dihydric phenols with unsubstituted phenolic groups. Recoveries depend on the degree of deactivation of the charcoal, but are usually good, and the method is rapid and simple. H.H.H.

Stereochemical Aspects of Aromatic Substitution. I—*peri*-Derivatives of Naphthalene
F. Bell, J. A. Gibson, and R. D. Wilson
J.C.S., 2335–2340 (July 1956)

The influence of steric factors in substitution reactions of 2:7-dihydroxy- and 2:7-diamino-naphthalenes is discussed. It appears that steric inhibition of substitution is slight, and that out-of-plane movements allow fairly ready entry of bulky substituents into the 1:8-positions of naphthalene. Additional evidence is reported to show that one of the Br atoms in dibromo-2:7-dihydroxynaphthalene is in position 6. H.H.H.

Separation of Positionally Isomeric Dialkylbenzenes: Alkylation–Dealkylation
B. B. Corson, W. J. Heintzelman, R. C. Odioso, H. E. Tiefenthal, and F. J. Pavlik
Ind. Eng. Chem., **48**, 1180–1182 (July 1956)

Mixtures of isomeric dialkylbenzenes are separated by alkylation with a bulky alkylating (e.g. *tert.*-butylating) agent insufficient in amount to react with all the isomers, so that only the most reactive is alkylated. The reaction product is easily separated by distillation into unchanged isomer and selective alkylate, which is subsequently dealkylated. Thus, *tert.*-butylation of 50 : 50 *m*- and *p*-xylene with *tert.*-butyl chloride in presence of ferric chloride gave a 44% yield of raffinate, of *m*–*p* composition 1 : 99, and 43% alkylate, which on dealkylation gave 98 : 2 *m*–*p*-xylene in 84% yield. Successful results were also obtained with ethyltoluenes and diethylbenzenes. W.K.R.

Benzoyloxylation, Halogenation, and Phenylation of Aromatic Compounds by Silver Bromide Dibenzoate and Silver Iodide Dibenzoate
D. Bryce-Smith and P. Clarke
J.C.S., 2264–2272 (July 1956)

Oxygen Radicals. VI—4-*tert.*-Butyloxy-2:6-di-*tert.*-butylphenoxyl
E. Müller, K. Ley, and W. Schmidhuber
Chem. Ber., 89, 1738–1748 (July 1956)

Griseofulvin. X—Orientation of some Derivatives of 5-Methoxyresorcinol
J. F. Grove, P. W. Jeffs, and D. W. Rustidge
J.C.S., 1956–1963 (July 1956)

Preparation of 7-Methyl-2-naphthol
T. G. Halsall and D. B. Thomas
J.C.S., 2564–2565 (July 1956)

The title substance is obtained by demethylation of 2-methoxy-7-methylnaphthalene, which was synthesised by Mitter and De's method (*J. Indian Chem. Soc.*, **16**, 199 (1939)); the m.p. of 7-methyl-2-naphthol is 87·5–88·5°C. H.H.H.

1:8-Dihydroxynaphthalene
Ng. Ph. Buu-Hoï and D. Lavit
J.C.S., 2412–2515 (July 1956)

Methylation of 1:8-dihydroxynaphthalene (I) gives (at variance with the literature) both a mono- and a di-ether. Formylation and acetylation of the latter occur at position 4. Homologues of I were prepared by Wolff–Kishner reduction of 4:5-dimethoxy-1-naphthaldehyde and 1-acetyl-4:5-dimethoxynaphthalene, and their demethylation led to 4:5-dihydroxy-1-methyl- and 1-ethyl-4:5-dihydroxy-naphthalene. In presence of HCl, I and ethyl acetoacetate (1 mol.) give 4′-hydroxy-4-methyl-7:8-benzocoumarin. H.H.H.

Liquid-phase Air-oxidation of *p*-Nitrotoluene under Pressure
N. Ohta and T. Tezuka
Reports Govt. Chem. Ind. Research Inst., Tokyo, 51, 249–252 (June 1956)

Photochemical Acceleration of the Hydrolysis of Nitrophenyl Phosphates and Nitrophenyl Sulphates
E. Havinga, R. O. de Jongh, and W. Dorst
Rec. Trav. chim., 75, 378–383 (April 1956)

Neutral and alkaline soln. of nitrophenyl phosphates and sulphates, which are stable in the dark, decompose on irradiation with visible or ultraviolet illumination. Nitrophenols and inorganic phosphates and sulphates are formed. The phosphoric esters show a marked increase in rate at pH > 12. With both series of compounds the *meta* derivatives are the more reactive. A.J.

Palladised Charcoal as a Catalyst for the Reduction of Aromatic Nitro Compounds by Hydrazine Hydrate
M. J. S. Dewar and T. Mole
J.C.S., 2556–2557 (July 1956)

1- and 2-Nitronaphthalene, 1-, 2-, 3-, and 9-nitrophenanthrene, 3-nitropyrene, 2-nitrochrysene, and 3-nitroperylene are rapidly and smoothly reduced by hydrazine hydrate, in the presence of palladised charcoal, to very pure amine in at least 60% yield after a single recrystallisation. The reduction occurs almost instantaneously with nitro deriv. of the very reactive hydrocarbons, viz. perylene and pyrene, but more slowly with those of the less reactive hydrocarbons. Nitrobenzene reacts very slowly, but *p*-nitroanisole is reduced smoothly to *p*-anisidine, and it seems unlikely that the method will be of much value for the reduction of unactivated nitrobenzene deriv. 8-Nitroquinoline, however, gives a 65% yield of 8-aminoquinoline. H.H.H.

Catalytic Amination of Organic Compounds. IV—Catalytic Amination of Aromatic Mononitro Compounds
N. S. Kozlov and G. N. Kozlov
J. Gen. Chem. U.S.S.R., 26, 803–806 (March 1956)

Nitro cpd. (nitrobenzene, *o*- and *p*-nitrotoluenes, and 1-chloro-2-nitro- and 1-chloro-3-nitro-benzenes) are treated in a continuous-flow system with NH_3 at 7–9 atm. in presence of activated alumina at 370°C. In all cases replacement of NO_2 by NH_2 occurs, the amine being obtained in 46–88% yield (on the amount of nitro cpd. that reacts; ~ 50% of the nitro cpd. is recovered unchanged). Under the given conditions the replacement of *ar*-NO_2 by NH_2 proceeds much more readily than the replacement of *ar*-Cl. A.E.S.

Preparation, Properties, and Alkylation of Toluene-*p*-sulphonamides
D. Klamann and H. Bertsch
Chem. Ber., 89, 2007–2012 (Aug. 1956)

7-Nitro-1-naphthylamine. I—Its Preparation, Halogenation, and Diazo Coupling; and 1:2:4:7-Tetrahalogenonaphthalenes
A. Hardy, E. R. Ward, and L. A. Day
J.C.S., 1979–1984 (July 1956)

7-Nitro-1-naphthylamine is best prepared by rearrangement of 1:2:3:4-tetrahydro-7-nitro-1-oxonaphthalene oxime acetate. Diazo coupling, chlorination, and bromination of the amine or its *N*-acetyl deriv. are described. 1:2:4:7-Tetrachloronaphthalene is found to be identical with Turner and Wynne's 1:2:7:*x*-tetrachloronaphthalene, and Guareschi's tetrabromonaphthalene is now unequivocally orientated as 1:2:4:6-tetrabromonaphthalene. H.H.H.

Photochemical Properties of Alkali Salts of Aryldiazosulphonic Acids
J. de Jonge and R. Dijkstra
Rec. Trav. chim., 75, 290–300 (April 1956)

Illumination of soln. of the stable forms of aryldiazosulphonates leads to the formation of coupling diazo compounds and sulphite ions. The reaction is reversed in the dark. The dark reaction is prevented in the presence of β-naphthol (coupling with diazo residue), lead acetate (formation of insol. sulphite), and acid (conversion of sulphite ions to bisulphite). The results give no positive indication of the mechanism of the reaction. A.J.

Absorption Spectra and Structure of some Solid Hydroxyazo Compounds
D. Hadži
J.C.S., 2143–2150 (July 1956)

Infrared and electronic spectra are given for solid 1-phenylazo-2-, 2-phenylazo-1-, and 4-phenylazo-1-naphthol, for their deuterated analogues, and for their *O*-methyl deriv.; also infrared spectra of *o*- and *p*-phenylazophenol are reported. The last two cpd. are shown to exist as true azo cpd., whereas both types of spectra indicate that the naphthalene deriv. exist in the solid state either as pure phenylhydrazones (1:4-naphthaquinone monophenylhydrazone) or as mixtures of both tautomeric forms. H.H.H.

Physical Properties of Aminoazobenzene Dyes. III—Tautomerism of 4-Aminoazobenzene Salt Cations in Acid Solution
E. Sawicki
J. Org. Chem., 21, 605–609 (June 1956)

The tautomerism of 16 dyes in 50% alcoholic HCl is investigated and discussed. The four 4-aminoazobenzenes gave evidence of proton addition to the β-nitrogen as well as to the amino nitrogen. 3-Amino- and, probably, 2-amino-azobenzene add the proton exclusively at the latter position, whilst 4-methylthioazobenzene adds it only to the β-nitrogen. H.E.N.

Structure of Protonated Aminoazobenzenes
W. S. McGuire, T. F. Izzo, and S. Zuffanti
J. Org. Chem., 21, 632–634 (June 1956)

From the ultraviolet absorption spectra of azobenzene, dimethylaminoazobenzene, and Methyl Orange separately dissolved in 95% ethanol and in the same solvent saturated with gaseous HCl, it is concluded that the proton is added mainly to the dimethylamino group. H.E.N.

Influence of Spatial Factors on the Properties of Dyes containing the Diphenyl Radical. IV—Monoazo Dyes
B. M. Krasovitskiĭ and T. A. Serova
Ukrain. khim. zhur., 22, 70–75 (1956): *Chem. Abs.*, 50, 9744 (10 July 1956)

The effect of a substituted X (= NO_2, Br, CH_3, CH_3·O, CH_3·S, OH, NH_2) on the dyeing properties of dyes of the type X·C_6H_4·C_6H_4·N:N·R is less pronounced than in those of type X·C_6H_4·N:N·R. Introduction of methyl groups in 2:2′-positions markedly decreases the effect of the substituent in the 4′-position along the conjugated double bonds. C.O.C.

Ethyleneazo Dyes
R. Wizinger and K. Atakan
Helv. Chim. Acta, **39**, 1330–1340 (Aug. 1956)

A simple method of preparation consists in warming a soln. of the methylcarbenium salt with an *anti*-diazoate in aqueous or alcoholic soln. As carbenium salts *N*-methylquinaldinium methyl sulphate, 9:10-dimethylacridinium methyl sulphate, *N*-ethyllepidinium iodide, and 1:2-dimethylbenzothiazolium methyl sulphate are employed successfully. The colour of soln. of the dyes depends on the dielectric constant of the solvent. H.E.N.

Co-ordinately Unsaturated Acridine–Formazyl Complex
M. Seyhan
Mh. Chem., **87**, 234–235 (Feb. 1956)

The nickel complex of the formazan from diazotised anthranilic acid and the phenylhydrazone of acridine-9-aldehyde is prepared. H.E.N.

Triazines. XV—Conversion of Chloro-*s*-triazines into *s*-Triazines
C. Grundmann and E. Kober
J. Org. Chem., **21**, 641–643 (June 1956)

The process of hydrogenolysis of the thiomethyl deriv. with Raney nickel has been improved. H.E.N.

Oxime of Michler's Ketone and its Ethyl Analogue
R. D. Morin, J. S. Warner, and R. H. Poirier
J. Org. Chem., **21**, 616–618 (June 1956)

These are now prepared using hydroxylamine in excess of alcoholic KOH. The cpd. previously so designated are shown to be the anilides formed by Beckmann rearrangement. H.E.N.

Spectroscopic Properties of Organic Photoconductors. II—Specular Reflection Spectra of Cationic Dye Films
J. W. Weigl
J. Chem. Phys., **24**, 577–580 (1956): *Chem. Abs.*, **50**, 9143 (10 July 1956)

A device is described in which concurrent transmission and specular reflection measurements were made on identical samples. The reflectivity and transmission of thin films of Malachite Green, Trypaflavine, Crystal Violet, Rhodamine B, and Pinacyanol are given in graphs. The observed spectra agreed in general with the results of dispersion theory. C.O.C.

Colour and Constitution. IV—Dyes with Crossed Absorption Systems II
S. Hünig and H. Schwarz
Annalen, **599**, 131–139 (July 1956)

2:6- (I) and 3:5-Dimethyl-4′:4″-bisdimethylaminofuchsone (II) are prepared with difficulty. The spectrum of II is similar to that of the fuchsone without *C*-methyl groups, showing a maximum at 480 mμ. in benzene, which moves to 500 mμ. in methanol. The absorption is due only to the aminofuchsone system. I, however, exhibits a peak between 450 and 500 mμ., with a pronounced shoulder at the side of longer wavelength, in the less polar solvents, becoming a very strong peak at 620 mμ. in methanol containing 1 mol. perchloric acid. The absorption of I is attributed to both an aminofuchsone and a Malachite Green system, the latter becoming dominant in solvents of high dielectric constant. It is shown that two molecular forms are present, each with the appropriate colour system planar, the molecule being unable to be wholly in one plane for steric reasons. The two forms are in equilibrium and are termed *allopolar isomers* after Brooker. H.E.N.

Synthesis of Heterocyclic Aldehydes
W. Ried and H. Bender
Chem. Ber., **89**, 1893–1896 (Aug. 1956)

Active methyl groups of heterocyclic cpd. form pyridinium iodides with iodine and pyridine. Condensation with *p*-nitrosodimethylaniline gives nitrones, which are decomposed by HCl to yield aldehydes. H.E.N.

Methods of Synthesis of Benzothiazoles
J. Metzger and H. Plank
Chim. et Ind., **75**, 929–939 (May), 1290–1303 (June 1956)

Review with bibliography complete to 1953 (384 references). C.J.W.H.

Thiazoles

XXVIII—Dithiazol-2-ylamines and their Nitration Products
H. Beyer and G. Berg
Chem. Ber., **89**, 1602–1608 (July 1956)

XXIX—Condensation Products of Thiosemicarbazide with α-Chloroacetic Ester and a Novel Ring Contraction of 2-Amino-5-methyl-6-ethoxycarbonyl-1:3:4-thiadiazine to 3-Methyl-4-ethoxycarbonyl-5-aminopyrazole
H. Beyer and G. Wolter
Ibid., 1652–1658

Mobility of π-Electrons in Heterogeneous Linear Molecules
R. N. Beale
Nature, **178**, 37–38 (7 July 1956)

Studies of electronic absorption spectra suggest that conjugated hetero groups in the chain of elongated planar molecules cause no decrease in mobility of the carbon π-electrons irrespective of whether or not the hetero groups make a contribution to the intensity of the transition considered. W.R.M.

Synthesis of Cyanine Dyes by the Condensation of *p*-Dialkylaminobenzaldehyde with appropriate Heterocyclic Compounds—VI
M. Q. Doja and A. K. Sinha
J. Indian Chem. Soc., **33**, 183–188 (March 1956)

Cyanine dyes have been prepared by the condensation of *p*-dimethylaminobenzaldehyde with 6-chloro-, 6-bromo-, and 6-iodo-quinaldine ethiodide and of *p*-diethylaminobenzaldehyde with 6-formamido- and 6-acetamidoquinaldine ethiodide in absolute alcohol in the presence of piperidine. The halogenated compounds are of no value as photographic sensitisers; the others sensitise strongly up to a wavelength of 6900 A. All the dyes exhibit fluorescence and pleochroism, and they dye silk, cotton, and wool from alcoholic soln. A.J.

Dipole Moments and Structures of Two Heteropolar Cyanine Dye Molecules
A. J. Petro, C. P. Smyth, and L. G. S. Brooker
J. Amer. Chem. Soc., **78**, 3040–3043 (5 July 1956)

In very dilute solutions in dioxan the molecular dipole moments of the holopolar cyanine dyes 1:3-bis-(2-methoxyethyl)-5-[bis-1:3-(3-ethyl-2-benzothiazolinylidene)-2-propylidene]-barbituric acid and 1:3-diethyl-5-[bis-1:3-(3-ethyl-2-benzothiazolinylidene)-2-propylidene]-2-thiobarbituric acid are 9·8 and 13·3 × 10^{-18} respectively. Comparison of these with those calculated for the possible resonating structures indicates that a full, or nearly full, electronic charge is carried by the acidic radical of the molecule, while an equal positive charge is equally divided between the N atoms of the two basic nuclei. 17 references. C.O.C.

Thio*mero*cyanine Dyes derived from 4-Thio-oxo-2:4-thiazolidinedione
J. Nys
Compt. rend. 27e Congr. intern. Chim. ind. (Brussels), **3** (1954): *Ind. chim. belge*, **20** (Spec. No.), 635–638 (1955): *Chem. Abs.*, **50**, 9386 (10 July 1956)

*mero*Cyanines are readily transformed into thio*mero*cyanines by treatment with P_2S_5 or Al_2S_3 in various solvents, e.g. pyridine, $CHCl_3$, or xylene. Several such transformations are described. C.O.C.

Polymethin Dyes from Heterocyclic Derivatives of Pyruvic Esters
W. Franke
Chem. Ber., **89**, 1887–1892 (Aug. 1956)

Eleven dyes are prepared by condensation of the heterocyclic pyruvic ester with an anil of a formylmethylene-heterocyclic cpd. The heterocyclic components are based on thiazol-2-yl and selenazol-2-yl deriv. The dyes act as sensitisers. Solvents of greater dielectric constant reduce the wavelength of maximum absorption, but quaternisation has a bathochromic effect. H.E.N.

Acyl Derivatives from Stenhouse Dyes
J. C. McGowan
Chem. and Ind., 523–524 (16 June 1956)

Acetylation in pyridine of the Stenhouse dyes (I), obtained by condensing aromatic amines and furfuraldehyde, yields the simple acylated amine and a diacylated aldehyde. Thus, the dye I ($R^1 = R^2 = H$; $Ar = C_6H_5$),

when treated with acetic anhydride, yielded acetanilide and II ($R^1 = R^3 = CO{\cdot}CH_3$; $Ar = C_6H_5$).

$Ar{\cdot}NR^1{\cdot}CH{:}CH{\cdot}CH{:}C(O{\cdot}R^2){\cdot}CH{:}NH{\cdot}Ar\}Cl$ (I)

$Ar{\cdot}NR^1{\cdot}CH{:}CH{\cdot}CH{:}C(O{\cdot}R^2){\cdot}CHO$ (II)

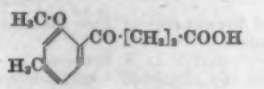
A.J.

Synthesis of Red 2(10*H*)-Phenazinone-type Sulphur Dyes
N. Kuroki, A. Katayama, and K. Konishi
J. Chem. Soc. Japan, Ind. Chem. Sectn., 58, 782–784 (1955): *Chem. Abs.*, 50, 9743 (10 July 1956)

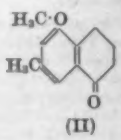
2:4-Diethylaminotoluene, dissolved in dil. H_2SO_4, was treated with *p*-aminophenol, dissolved in water, neutralised with Na_2CO_3, made alkaline with ammonia, and boiled with MnO_2 to yield the red 10-ethyl-7-methyl-8-ethylamino-2(10*H*)-phenazinone, which on treatment with Na polysulphide yielded a red sulphur dye. Other red to violet–red sulphur dyes were similarly obtained. Their dyeings on cotton and vinylon had only moderate fastness to light, rubbing, and washing. C.O.C.

Studies in Mycological Chemistry. V— Synthesis of 2:5-Dihydroxy-7-methyl-1:4-naphthaquinone
J. E. Davies and J. C. Roberts
J.C.S., 2173–2176 (July 1956)

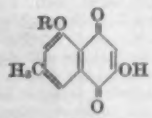
The quinone named above was required as a reference cpd. in an attempt to identify a pigment obtained by degradation of purpurogenone (cf. *J.C.S.*, 2992 (1955)). Its synthesis followed from β-(2-methoxy-4-methylbenzoyl)-propionic acid (I), one of the products resulting from the reaction of *m*-cresol with succinic anhydride in presence of aluminium chloride and subsequent methylation, which cyclises with "polyphosphoric acid" to the tetralone (II), converted via the dianil to the naphthaquinone (III: R = CH_3), and by demethylation to 2:5-dihydroxy-7-methyl-1:4-naphthaquinone (III: R = H).



(I)



(II)



(III)

H.H.H.

Absorption Spectra of Ketones. IV— Steric Requirements for Spectroscopic Interaction between a Carbonyl Group and a βγ-Double Bond
R. C. Cookson and N. S. Wariyar
J.C.S., 2302–2311 (July 1956)

Examination of the absorption spectra of some new *bicyclo*[2:2:2]octenones and of some other ketones indicates that the carbonyl band near 290 mμ. is abnormally intense only when the *p*-orbitals of $C_{(1)}$ and $C_{(3)}$ in the system $C^1O{-}C^1{-}C^2{=}C^3$ point at one another. The intensity of the band is increased by substitution on the olefinic double bond. H.H.H.

New Synthesis of 5:6- and 7:8-Benzo*iso*quinolines
C. F. Koelsch and R. M. Lindquist
J. Org. Chem., 21, 657–659 (June 1956)

4-Nitrofluorene-5-carboxylic Acid
E. K. Weisburger
J. Org. Chem., 21, 698–699 (June 1956)

This cpd. is shown to be formed in up to 19% yield in the nitration of fluorene-4-carboxylic acid. It was identified by oxidation to the fluorenone, and by conversion by the Schmidt reaction into 4-amino-5-nitrofluorene and, further, by deamination to 4-nitrofluorene or by catalytic reduction to 4:5-diaminofluorene. H.E.N.

Synthesis of Nitro- and Amino-3:4-benzocinnolines
J. C. Arcos, M. Arcos, and J. A. Miller
J. Org. Chem., 21, 651–654 (June 1956)

3-Amino-4-nitroacenaphthene
H. J. Richter
J. Org. Chem., 21, 619–620 (June 1956)

The cpd. is prepared from 3-acetylacenaphthene by nitration, oximation, rearrangement, and hydrolysis. Its orientation is established by catalytic reduction and conversion into the known 5:6-bisbenzamidoacenaphthene. H.E.N.

Synthesis of 3:4-Benzopyrene-1:5-quinone
R. O. C. Norman and W. A. Waters
J.C.S., 2379–2380 (July 1956)

Alternative routes for the synthesis of 3:4-benzopyrene are explored, and an improvement is reported in the Bachmann *et al.* synthesis from pyrene (cf. *J. Amer. Chem. Soc.*, 63, 1682 (1941)). A new synthesis is described via a Stobbe condensation of *tert.*-butyl acetate with methyl *o*-1-naphthoylbenzoate to give *tert.*-butyl 2-carboxy-β-1-naphthylcinnamate, which is then converted into 3:4-benzopyrene-1:5-quinone by the use of $SnCl_4$ or polyphosphoric acid. H.H.H.

Isolation of 4:9-Dihydroxyperylene-3:10-quinone from a Fungus
J. M. Anderson and F. J. Murray
Chem. and Ind., 376 (12 May 1956)

Extraction of the fruiting bodies of *Daldinia concentrica* (Bolt) Ces. & de Not. with acetone yields a red soln. which deposits a black amorphous powder. On vacuum sublimation this yields dark red needles having spectra in conc. H_2SO_4, tetrachloroethane, and paraffin mull identical with those of 4:9-dihydroxyperylene-3:10-quinone. The bisboroacetate and reduced tetra-acetyl derivatives also appear identical with the synthetic compounds. A.J.

Structure of Isatin and Substituted Isatins
D. G. O'Sullivan and P. W. Sadler
J.C.S., 2202–2207 (July 1956)

Vibrational spectra for isatin and a series of substituted isatins provide no support for the existence of a classical lactim structure in the solid state or in dil. soln. in chloroform. Strong intermol. hydrogen bonding is present in all but three of the 23 cpd. examined, and two of the exceptions possess intramol. hydrogen bonds; the remaining cpd., *N*-methylisatin, cannot show hydrogen bonding. Substituents in the benzene ring have only a minor effect on the CO and NH stretching frequencies, but a correlation exists between frequency and chemical reactivity of the β-carbonyl group. The influence of substituents on the character of the ring frequencies is more pronounced. H.H.H.

Fluorescent Brightening Agents
C. Delecluse
Teintex, 21, 271–281 (April), 363–375 (May 1956)

The applications of the Ciba range are tabulated, and methods of assessment are discussed. S.R.C.

Properties of Metalloporphyrins
R. J. P. Williams
Chem. Rev., 299–328 (1956): *Chem. Abs.*, 50, 9430 (10 July 1956)

Review, 101 references. C.O.C.

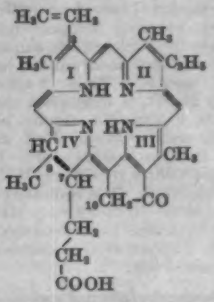
Colouring Matters of Ponderosa Pine Bark— I
E. F. Kurth, V. Ramanathan, and K. Venkataraman
J. Sci. Ind. Res., India, 15 B, 139–146 (March 1956)

The flavanols of the bark of Ponderosa pine trees are better extracted with hot methyl ethyl ketone than with benzene. The total flavanol content of the butt logs of old trees is ca. 2·4%. From the original extract, taxifolin (1·25%) may be removed with hot water, leaving the yellow colouring matter. Chromatography of the (phenolic) colouring matter and of its methylated derivative shows it to be a mixture of quercetin, 6-methylquercetin, and 6-methylmyricetin. The structures of the last two are proved. A.J.

Chlorophyll and Related Compounds
C. E. Ficken, R. B. Johns, and R. P. Linstead
IV— Position of the Extra Hydrogens in Chlorophyll. The Oxidation of Pyrophaeophorbide-*a*
J.C.S., 2272–2280 (July 1956)

From the oxidation products of pyrophaeophorbide-*a* (I) it is concluded that Fischer's 1940 formulae for the phorbides and chlorophyll-*a*, with the extra H atoms in ring IV (picked out by the *thick* line), are correct in this respect; and that the extra H atoms are in the *trans* positions. The implications of these results on the structures

of chlorophyll-*b* and bacteriochlorophyll are briefly indicated. This structure (I) differs from that of chlorophyll-*a* only in three minor respects: the absence of a methoxycarbonyl group at $C_{(13)}$, the removal of the phytyl group from the propionic acid side-chain at $C_{(7)}$, and the replacement of the central Mg by H.



V— Dihydrohaematinic Acids and their Imides
Ibid., 2280–2283

The two diasteroisomeric forms of dihydrohaematinic acid $HOOC{\cdot}CH(CH_3){\cdot}CH(COOH){\cdot}CH_2{\cdot}CH_2{\cdot}COOH$ and their imides are prepared and characterised, their interconversions studied in relation to those in the *aa'*-dimethylsuccinic series, and probable constitutions assigned (as shown). H.H.H.

Phaeophytin-sensitised Photoreduction of *p*-Dimethylaminoazobenzene by Ascorbic Acid
R. Livingstone and R. Pariser
J. Amer. Chem. Soc., **78**, 2944–2948 (5 July 1956)

Photochemical Oxidation-Reduction Reactions sensitised by Chlorophyll-*a* and Phaeophytin-*b*
R. Livingstone and R. Pariser
J. Amer. Chem. Soc., **78**, 2948–2950 (5 July 1956)

Orcein Dyes. II— Separation of the Components of Orcein
H. Musso
Chem. Ber., **89**, 1659–1673 (July 1956)

By means of partition chromatography orcein is shown to consist of fourteen components, of which five were obtained crystalline and a further four chromatographically pure. More than 90% of the orcein is accounted for. H.E.N.

Natural Plant Products bearing a Nitro Group. I— Aristolochic Acid
M. Pailer, L. Belohlav, and E. Simonitsch
Mh. Chem., **87**, 249–268 (April 1956)

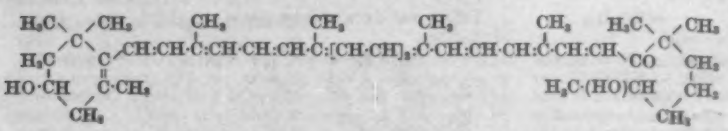
This yellow substance, obtained from *Aristolochia clematitis* L., but present also in other members of the genus, is shown to be 3:4-methylenedioxy-8-methoxy-10-nitrophenanthrene-1-carboxylic acid. H.E.N.

Colouring Matters of *Garcinia Morella*. II— Infrared and Ultraviolet Absorption Spectra of Morellin and its Reduction Products
N. V. Bringi, M. R. Padhye, and K. Venkataraman
J. Sci. Ind. Res., India, **15 B**, 128–138 (March 1956)

Details of the infrared spectra of morellin and its hydrogenated products in carbon tetrachloride soln. or in Nujol mulls and of the ultraviolet spectra in ethanol soln. A.J.

Modified Chromic Acid Degradation and its Use in determining the Constitution of a Carotenoid Pigment (Capsanthin)
R. Entschel, C. H. Eugster, and P. Karrer
Helv. Chim. Acta, **39**, 1263–1269 (Aug. 1956)

The formula for the colouring matter of paprika is modified to—



H.E.N.

Colouring Matter of the Red Carrot
M. Yamaguchi
Mem. Fac. Sci., Kyushu Univ., **C 2**, 49–51 (Dec. 1955)

Extraction of the root of the red carrot (*Daucus Carota, gard. var.* "*Kintoki*") with petroleum, methanol, and benzene mixtures shows that the pigments consist of ca. 80% of lycopene and only ca. 20% of β-carotene. Phytoxanthins and α-, γ-, and δ-carotenes are also obtained in small yield. A.J.

Stepwise Hydrogenation of Carotene
G. Gorbach and P. Hochbahn
Mh. Chem., **87**, 231–233 (Feb. 1956)

Chemical Mechanism of Bile Pigment Formation
R. Lemberg
Rev. Pure and Appl. Chem. (Australia), **6**, 1–23 (1956); *Chem. Abs.*, **50**, 9457 (10 July 1956)

Review, 120 references. C.O.C.

Pyrrolecarboxylic Acids. IV— Paper Chromatography of Pyrrolecarboxylic Acids and Applications to the Study of Three Black Pigments: Sepiomelanin, Tyrosinemelanin, and a Pyrrole Black
Gazz. chim. ital., **85**, 1378–1399 (1955)

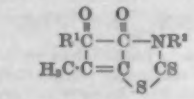
Ferrocyanides and their Applications— Some New Double and Triple Ferrocyanides
T. Gaspar y Arnal and J. Vega Bragado
Chim. et Ind., **75**, 917–926 (May 1956)

The general properties of ferrocyanides are reviewed, particularly the preparation and use of double ferrocyanides, e.g. $Rb_2MgFe(CN)_6$ and $Cs_2MgFe(CN)_6$, for the separation of rubidium and caesium. It has been shown that there are possibilities of several double ferrocyanides of cobalt, and the preparation and properties of those with Na, K, and NH_4 and the triple ferrocyanide with NH_4 and K are described. The composition of the pigment Aragon Green is shown to be $CaCoFe(CN)_6$. Thermal decomposition curves for Aragon Green and the new compounds are given. A.J.

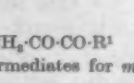
PATENTS

Rhodanine Intermediates for *mero*Cyanine Dyes
Kodak *BP* 753,648

Compounds of formula—



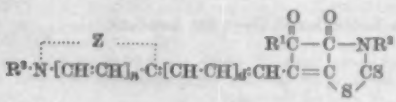
(R^1 = CH_3 or alkoxy; R^2 = Alk, subst. Alk or alkenyl), e.g. 5-(butan-3-on-2-ylidene)-3-carbethoxyethyl-2-thiothiazolid-4-one, are obtained by condensing a compound of formula—



with one of formula—

$$CH_3{\cdot}CO{\cdot}CO{\cdot}R^1$$

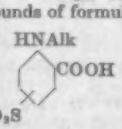
They are used as intermediates for *mero*cyanine dyes of formula—



(R^2 = Alk, or subst. Alk or alkenyl; *n* and *d* = 0 or 1). C.O.C.

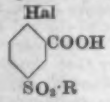
Sulpho-*N*-alkylanthranilic Acids and their Derivatives— Stabilisers for Diazoamino Compounds
FBy *BP* 753,735

Compounds of formula—



(R = OH or aminoalkanesulphonic acid linked by its

N atom to the SO_3 group) are obtained by heating dry alkali-metal salts of compounds of formula—

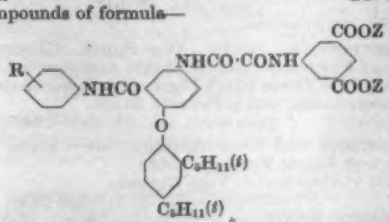


with anhydrous primary aliphatic or *cyclo*aliphatic amines in presence of metallic Cu or Cu salts, e.g. by heating the monosodium salt of the 5-*N*-methyltauride of 2-chloro-5-sulphobenzoic acid with *cyclo*hexylamine in presence of cuprous chloride. They are particularly suitable as stabilisers for diazoamino compounds. C.O.C.

Colour Couplers

Kodak *BP* 753,154

Compounds of formula—

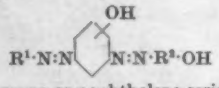


(R = group of atoms containing a coupling group which reacts with the oxidation products of a primary aromatic amino developer and is attached to the nucleus in *m* or *p* position; Z = Alk or alkali metal), e.g. 1-hydroxy-4-chloro-*N*-{4-[2-(2:4-di-*tert.*-amylphenoxy)-5-(3:5-dicarbomethoxyoxyanilamido)benzamido]phenethyl}-2-naphthamide, are used as colour couplers particularly for use with the water-insoluble binders described in *BP* 524,154 and 541,589. C.O.C.

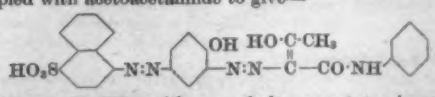
Metal(Chromium and Cobalt)-complex Disazo Dyes for Wool, Nylon, etc.

S *BP* 753,141

oo'-Dihydroxydisazo compounds—



(R^1 = aryl of benzene or naphthalene series; R^2 = residue of a naphthol or keto-methylene compound; the OH groups are both in *ortho* position to the same azo group) containing at least one solubilising group selected from COOH, SO_3H, acylamino, SO_2Alk, and sulphamyl, are converted into Cr or Co complexes containing 2 mol. of disazo compound to 1 atom of metal. The products dye wool, nylon, etc. from neutral or weakly acid baths. Thus 1-*m*-amino-*p*-hydroxyphenylazonaphthalene-4-sulphonic acid is diazotised and coupled with acetoacetanilide to give—

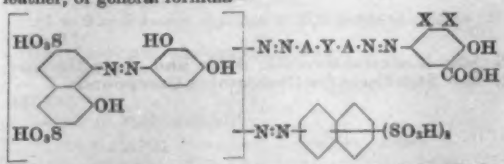


Heating at 70–75°C. with aq. cobaltous acetate gives the cobalt complex, which dyes wool and nylon orange. E.S.

Brown Tetrakisazo Dyes for Leather

Gy *BP* 752,801

Tetrakisazo dyes of good solubility in acid liquors, giving level deep browns on chrome-tanned and suède leather, of general formula—



(A = a *p*-phenylene or -toluylene radical; one X = H, the other = H or CH_3; Y = direct link, –NH·CO–, or –NH·CO·NH–) are made as follows— (1) Diazotised H acid is coupled with resorcinol. (2) This monoazo compound is then coupled with a diazotised naphthylaminedisulphonic acid. (3) The disazo dye so formed is coupled with the diazo compound formed by coupling a tetrazo compound of the diphenyl, diphenylurea, benzanilide, or preferably benzidine series with 1 mol. of salicylic acid or its 3- or 4-methyl compound. E.S.

Fluorescent Brightening Agents

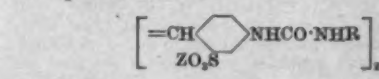
DuP *USP* 2,720,528

The aromatic triazoles obtained by oxidising *o*-aminoazo dyes obtained by coupling 2-diazobenzothiazoles with naphthylamines free to couple *ortho* to the amino group have blue fluorescence and are resistant to hypochlorite and other bleaching agents. Thus 2-aminobenzothiazole dissolved in conc. H_2SO_4 is diazotised and added to aq. Broenner's acid at 0–5°C. Na acetate is added till the solution is weakly acid to Congo Red, and the mixture allowed to come to room temperature. It is then made alkaline to Brilliant Yellow by adding 30% NaOH and the dye salted out with NaCl. It is re-dissolved in water and heated for 2–3 hr. at 60–70°C. with aq. NaOCl, the NaOCl being replenished from time to time to maintain a positive starch–iodide test. The solution is clarified with charcoal and the product salted out. C.O.C.

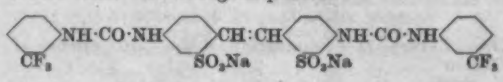
4:4'-Bis(trifluoromethylphenylureido-2:2'-stilbenedisulphonic Acids— Fluorescent Brightening Agents

General Aniline *USP* 2,720,538

Compounds of formula—



(Z = H or cation; R = subst. or unsubst. trifluoromethylphenyl) are fluorescent brightening agents applicable to paper and to nylon, wool, silk or protein fibres particularly from soaps and detergents. Thus 4:4'-diamino-2:2'-stilbenedisulphonic acid is dissolved in water with the aid of Na_2CO_3, heated to 40°C. and 3-trifluoromethylphenyl *iso*cyanate slowly added followed by heating to 85°C. for several hours. On cooling the product—

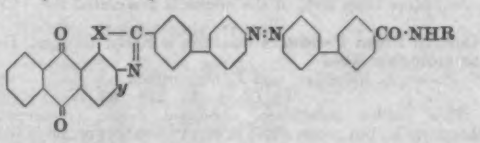


may be separated in the usual manner. C.O.C.

Yellow Anthraquinone Vat Dyes

DuP *USP* 2,719,838

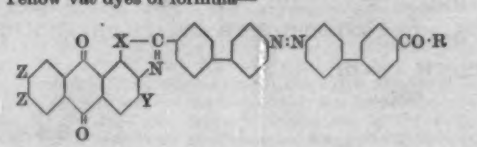
The yellow vat dyes of formula—



(X = O or S; y = H, Hal or SO_3H; R = anthraquinonyl either unsubst. or subst. by Hal, CH_3, CH_3O or benzoylamino; there is at least one sulphonic group attached in the β-position to one of the anthraquinone nuclei but in no case does either anthraquinone nucleus contain > 1 sulphonic group) yield strong and bright dyeings and prints of good fastness properties. The oxazole dyes are best prepared by condensing, in an inert medium, 4:4'-azodiphenyl-4'':4'''-dicarboxylic acid chloride with a 2-amino-1-halogenoanthraquinone or a sulphonic acid thereof, further condensing the resulting mono acid chloride with an aminoanthraquinone or a sulphonic acid thereof and ring-closing to the oxazole compound in presence of an acid-binding agent and a catalyst at 180–220°C. The thiazole dyes are best prepared by condensing 4:4'-azodiphenyl-4'':4'''-dicarboxylic acid chloride with an aminoanthraquinonesulphonic acid, and further condensing with a 2-amino-1-mercapto-(Na)-anthraquinone at 180–220°C.

USP 2,719,839

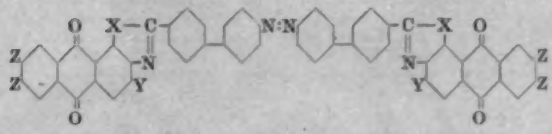
Yellow vat dyes of formula—



(X = O or S; Y = H, Hal, or SO_3M (M = H or alkali metal); R = Cl, OH, NH_2 or oxyalkyl (Alk of 1–18 C); one of the positions Z or Y carries the group SO_3M) are similarly prepared. They can be used for dyeing and printing or as intermediates for preparing other vat dyes.

USP 2,719,840

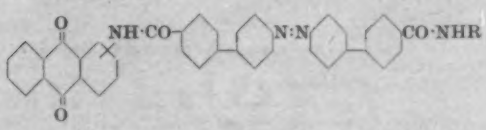
Dyes of formula—



(X = O, S or NH; at least one of the anthraquinone nuclei contains not more than one SO_3M group (M = H or alkali metal) in Y or Z position; one of the remaining Y and Z positions in each nuclei = H or Hal and the remaining Y and Z = H) yield fast yellow vat dyeings and prints. The azole dyes are prepared in the usual manner from suitably substituted aminoanthraquinones and carboxylic acids. The bis-oxazoles are best prepared by condensing a halogenated aminoanthraquinone-β-sulphonic acid with a 4:4′-azodiphenyl-4″:4‴-dicarboxylic acid, further condensing with an aminohalogenoanthraquinone or its sulphonic acid and finally ring-closing. Thiazoles, oxazole–thiazoles, oxazole–iminazoles are similarly prepared.

USP 2,719,842

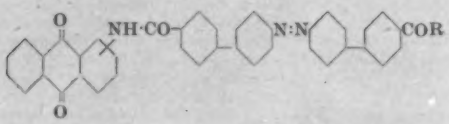
Yellow vat dyes particularly suitable for use in printing have the formula—



(R = a vattable anthraquinone radical which is either unsubst. or subst. by a single Hal, CH_3, COOH or benzoylamino; the two anthraquinone groups are attached to the NH group in either α- or β-positions; at least one of the anthraquinone nuclei contains in β-position a single SO_3M group (M = H, Na or K)) are obtained by condensing an aminoanthraquinone or its β-sulphonic acid with 4:4′-azodiphenyl-4″:4‴dicarboxylic acid chloride, further condensing with an aminoanthraquinone-β-sulphonic acid or halogenoaminoanthraquinone-β-sulphonic acid at 100–210°C.

USP 2,719,841

Compounds of formula—



are themselves yellow vat dyes but are particularly useful as intermediates for preparing oxazole and thiazole vat dyes as described in the above patents. C.O.C.

Anthraquinone–Amidine Copper Complexes

James Anderson & Co. (Colours) *BP* 750,604

Amidines $R^1{\cdot}NH{\cdot}CX{:}N{\cdot}R^2$ (R^1 and R^2 = the same or different 2-anthraquinonyl radicals; X = H, Alk, Ar or aralkyl), prepared by treating 2-aminoanthraquinones or 1-halogeno-2-aminoanthraquinones with ethyl orthoformate or formaldehyde, are heated in presence of Cu or a Cu compound to give copper complexes, which are pigments and intermediates for dyes. Both reactions may be carried out simultaneously. Thus 2-aminoanthraquinone, paraformaldehyde, K_2CO_3, Cu bronze and nitrobenzene are refluxed for 90 min. R.K.F.

Cyclisation of Polyanthrimides

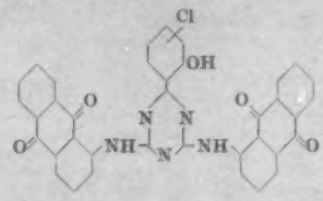
Ciba *BP* 749,792

Polyanthrimides containing only anthraquinone nuclei and numbering $\not<$ 3 are treated with a chlorinating or brominating agent before cyclising to the corresponding carbazoles. Thus the tetra-anthrimide obtained by condensing 4:4′-diamino-1:1′-dianthrimide with 1-chloroanthraquinone is treated with SO_2Cl_2 in nitrobenzene at 70–80°C. for 5 hr. The resulting chlorinated product is cyclised in pyridine and $AlCl_3$ at 100–140°C. for ca. 2 hr. After pouring into water and treating with NaOCl, a grey vat dye is obtained. R.K.F.

Halogenated Triazine Vat Dyes

American Cyanamid Co. *BP* 750,861

2-*o*-Hydroxyphenyl-4:6-bisanthraquinonyl-1′-amino-1:3:5-triazines (cf. *BP* 691,506—*J.S.D.C.*, **69**, 350 (1953)), which may also carry Cl or Br in the 3-positions of the anthraquinonyl residues, are treated with a halogenating agent, so that $\not<$ 1 halogen enters the hydroxyphenyl nucleus. Yellow vat dyes are obtained which are faster to light and more stable in the leuco state than Yellow GC. Thus the dye—



is formed by heating at 50°C. 2-*o*-hydroxyphenyl-4:6-bisanthraquinonyl-1′-amino-1:3:5-triazine and SO_2Cl_2 in *o*-dichlorobenzene containing iodine. R.K.F.

Tetra-azaporphin (Phthalocyanine) Intermediates and Dyes

ICI *BP* 749,692

Metal tetra-azaporphins (phthalocyanines) are converted to their chloro- or bromo-methyl derivatives by e.g. treating with *s*-dichlorodimethyl ether at 60–80°C. in pyridine and in presence of $AlCl_3$. Separation is effected by pouring into HCl and ice.

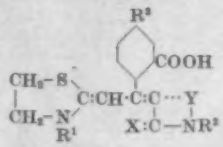
BP 750,240

These derivatives are converted to water-soluble ternary sulphonium, quaternary ammonium, or *iso*thiouronium salts by treatment with, respectively, an alkal-metal sulphide followed by an ester, a tertiary amine, or a thiourea. Thus nickel tetrakischloromethyltetramethyldibenzotetra-azaporphin is heated at 95–100°C. for 10 min. with tetramethylthiourea and the resulting dye separated by adding acetone. The products are suitable for dyeing and printing, particularly cellulosic fibres. R.K.F.

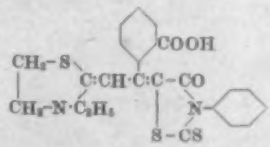
*mero*Cyanine Dyes containing *o*-Carboxyphenyl Groups in the Methin Chain

DuP *BP* 753,174

Dyes of formula—



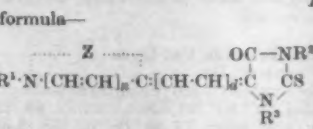
(X = O or S; Y = atoms to complete a 5-membered ring; R^1 = Alk or aralkyl; R^2 = Alk, Ar, carboxyalkyl, carboxyaryl, sulphoaryl or aralkyl; R^3 = H, Ar, aryloxy or alkoxy), e.g. the orange–red dye—



obtained by refluxing 2-methylthiazoline ethiodide, *N*-phenylrhodanine, phthalic anhydride and pyridine, are more soluble in water than dyes free from carboxyphenyl groups. They are however only slightly soluble in acid although readily soluble in alkali. This makes them of particular value as photographic sensitisers in multilayer elements. C.O.C.

_mero_Cyanine Dyes containing a 2-Thiohydantoin Nucleus
Kodak *BP* 753,637

Dyes of formula—



(R^1 = subst. or unsubst. Alk; R^2 = subst. or unsubst. Alk or *cyclo*Alk; $n = 0$ or 1; $d = 1$ or 2; R^3 = acyl; Z = atoms to complete a 5- or 6-membered ring), e.g. 1-acetyl-5-[(3-ethylbenzoxazolin-2-ylidine)ethylidine]-3-methyl-2-thiohydantoin, have photosensitising properties. C.O.C.

Finely Divided Metal Oxides
Deutsche Gold- und Silber-Scheideanstalt vormals Roessler *BP* 752,654

Finely divided metal oxides are produced by thermal and/or hydrolytic decomposition of metal compounds which form apart from the oxide only products which are volatile at high temperatures. The metal compounds are introduced as finely divided liquids, e.g. either molten or in solution or dispersion, into a chamber having gas-permeable walls in which the compounds are treated with hot gases. C.O.C.

White Silicate Pigments
J. M. Huber Corpn. *BP* 753,052

White pigments of unusual brightness and very fine particle size are produced by mixing together dilute aqueous solutions of an alkali-metal silicate and a water-soluble aluminium salt of a mineral acid. The silicate solution should be $\ngtr 2$ molar concentration (calc. as alkali metal oxide) and the salt at $\ngtr 1$ molar concentration. The mixing should be done under alkaline conditions and with vigorous stirring. C.O.C.

Dyeing and Printing Polyacrylonitrile Textiles (VIII p. 505)

V—PAINTS; ENAMELS; INKS

Rheological Properties of Printing Inks
B. N. Shakhkel'dyan
Kolloid. zhur., **18**, 111–119 (Jan.–Feb. 1956): *Chem. Abs.*, **50**, 9755 (10 July 1956)

At velocity gradients of 10^{-6} and 10^{-4} sec.$^{-1}$ the viscosity η of printing inks was $1–6 \times 10^7$ poises for inks containing Phthalocyanine Blue, Fast Light Yellow, or Carbon Black, and $10^4–10^5$ poises for inks containing Chrome Yellow and a white pigment. At velocity gradients of some sec.$^{-1}$, η was 300–2200 for all inks. The first group showed thixotropy in 10 min., the second group did not. The η of polymerised linseed oil was raised more by mixing a pigment with it the smaller the η of the ink at the start. The yield stress of the ink was greater the greater η. Presumably particle aggregation was greater in oils of smaller η. The ratio η/η_0 (η_0 = viscosity of unpigmented oil) for a given pigment concn. was greater for oxidised linseed oil, with or without an alkyd resin present, than for polymerised oil. Addition of alkyd resin to printing ink prevents clogging of the ink by small amounts of water. C.O.C.

PATENTS

Quick-setting Printing Inks
J. M. Huber Corpn. *USP* 2,720,461

A varnish for printing ink is obtained by neutralising a water-insoluble resin of A.V. $\nless 90$ with a nitrogenous base of dissociation constant $> 10^{-5}$ and dissolving it in a formamide, alcohol, glycol, glycol ether or ester containing 2–8 C and only H and O or a mixture of such solvents with water. C.O.C.

Water-base Stencil-duplicating Inks
A. B. Dick Co. *BP* 752,335

The ink contains $> 50\%$ by wt. of water, a dye or pigment, a water-soluble macromolecular organic compound to bring the ink to a viscosity of 35–150 sec. (measured by a Stormer Viscosimeter under a 215 g. load at 20°C. with centre baffle and a thermometer well) to provide the adherent base upon drying, and enough of a water-insoluble, water-dispersible, film-forming polymer to protect the copy upon drying; e.g. 16% Carbon Black in 40% aqueous dispersion, 2% of dioctyl ester of sodium sulphosuccinate in 50% solution, 40% polyvinyl chloride in 55% aqueous dispersion and 42% high-viscosity hydroxycellulose in 10% aqueous solution. *BP* 752,336

The ink contains $> 50\%$ of water, a dye or pigment and a water-soluble complex double salt of a high-mol.wt. organic resinous compound. One of the salt-forming compounds is a metal which forms an insoluble salt with the bodying agent and the other is ammonium, e.g. 5% Nigrosine J, 2% dioctyl ester of sodium sulphosuccinate in 50% solution, 1·5% glyoxal in 30% soln., 35% ethylene glycol and 56·5% zinc ammonium carboxymethylcellulose. *BP* 752,337

Balance between solubility in the ink and insolubility upon drying is obtained by use of a bodying agent in the form of its water-soluble salt formed with a component which is removed on drying, e.g. ammonium salt of a natural or synthetic resin, polysaccharide or protein. C.O.C.

Heat-resistant Finishing Composition
Allied Chemical & Dye Corpn. *BP* 753,767

A solution of an organo-silanol and a resinous rosin ester of a polyhydric alcohol is used as a vehicle for inorganic or metal leaf or powder pigments. It improves the leafing of leafing pigments and on being baked yields a finish of excellent resistance to temperatures of 1000–1500°F. as well as to chemicals and weathering. C.O.C.

VI—FIBRES; YARNS; FABRICS

Non-woven Fabrics
C. E. Coke
Canadian Textile J., **73**, 51–55 (29 June 1956)

Second-order Transition Temperature and Fibre Properties
T. Eeg-Olofsson; A. Brown
Text. Research J., **26**, 352–354 (May 1956)

Criticism of a paper by Brown (*ibid.*, **25**, 891–901 (1955): J.S.D.C., **72**, 184 (April 1956)) and reply by the author. J.C.F.

Properties of Textile Materials. V—The Action of Light on Textile Materials
G. S. Egerton
J. Textile Inst., **47**, P 476–P 480 (July 1956)

A brief survey is presented, in which the chemical changes caused by light, the degradation of textiles by light, and dye fading are discussed. J.W.B.

Formation of Free Radicals in Polymer Films on Irradiation
G. S. Egerton and S. L. Fitton
Nature, **178**, 41–42 (7 July 1956)

Undyed films of cellulose acetate, nylon, and methoxymethylnylon have been exposed to the effect of heat and/or radiation. Absorption spectra of the unexposed films are not appreciably changed on heating in oxygen or nitrogen at 50°C. in the dark for 150 hr. Prolonged exposure in either gas to a high-pressure mercury-vapour lamp produces only slight changes in absorption spectra. Exposure to a low-pressure mercury lamp emitting mainly at 2537 A. causes (*a*) an effect immediately following exposure and (*b*) a post-irradiation effect which appears on storage in the dark and which is greater on storage at higher temperatures. With cellulose acetate the immediate effect is greater when the film is exposed in nitrogen. There is some evidence for the splitting off of the methoxymethyl group from methoxymethylnylon. The results suggest that on irradiation with near-ultraviolet and visible light no trapped free radicals are produced in the polymer, and it appears to be doubtful whether free radicals play any part in the degradation of textile materials exposed to sunlight behind glass. W.R.M.

Factors influencing the Water Imbibition of Fabrics Intended for Use as Glass Cloths
C. M. Dorkin and N. H. Chamberlain
J. Textile Inst., **47**, T 371–T 384 (July 1956)

Commercial observation shows that glass cloths made from spun rayon are less effective than similar fabrics from cotton or linen, despite the showing, in laboratory tests, that rayon has the higher total water imbibition. It is pointed out that such imbibition measurements, generally assessed by centrifuging, may be invalid in respect of this particular end-use, as glass cloths are usually discarded

only when wringing wet. Centrifugal measurements are made on a number of different fabrics, over a range of *g*, and the total water in a fabric is divided into fibre water (actually inside the fibre), interfibre water (between the fibres), and weave water (between the yarns). It is presumed that the useful water uptake is that corresponding to the point at which the structure is saturated to the verge of gross flooding, but not beyond it. Thus, the cloth should imbibe as much water as possible between the fibres. It is shown that the distribution of water in different fabrics varies widely: in cotton cloths it is mainly interfibre, very little being interweave; in linen it is mainly interweave, though with the type of structure employed there may be little difference in size between many interfibre spaces and the interweave spaces. Generally, cotton appears more useful than linen. With certain viscose rayon fabrics, however, the swelling on wetting is so great that the structure tightens up, and thus lowers the capacity of interfibre and interweave spaces. The optimum design appears to be that in which fibres with high internal uptake of water are used, being themselves of low denier to give more interfibre spaces; the weave should be open enough to prevent jamming, the sett being only slightly below jamming point to avoid excessive interyarn spaces. Tests on such fabrics indicate complete suitability. J.W.B.

Behaviour of certain Cotton and Linen Fabrics with respect to the Absorption of Water and Drying
F. E. Petzel
Amer. Dyestuff Rep., **45**, 390–404 (18 June 1956)

A study is made of the differences in absorption of water by, and the drying of, desized, plain-weave, crash dish towels composed of cotton, linen, and a mixture of 75% cotton plus 25% linen. The absorption of the cotton fabrics is markedly higher than that of those made from linen, but about the same as those of cotton and linen. After drying for 10 min. the linen towels contain least moisture, with a lower total drying time and a shorter period of constant rate of drying. J.W.B.

Heterogeneous Acid Hydrolysis of Native Cellulose Fibres
E. A. Immergut and B. G. Ránby
Ind. Eng. Chem., **48**, 1183–1189 (July 1956)

The heterogeneous hydrolysis of wood and cotton cellulose fibres with constant-boiling hydrochloric acid consists of an initial rapid process and a subsequent slower first-order reaction, which was studied over the range 80–15% residual hydrocellulose. During this slow hydrolysis, the $\overline{D.P.}$ (osmotic), the size of the crystalline micelles, and the X-ray diagram of the cotton hydrocellulose remained unchanged, whilst the wood hydrocellulose showed a 30% decrease in $\overline{D.P.}$, a 25% decrease in micelle width, and a widening of its X-ray reflections. The results indicate a basic difference in chemical resistance between wood and cotton celluloses. W.K.R.

Pyrolysis of Cellulose in a Vacuum
S. L. Madorsky, V. E. Hart, and S. Strauss
Bur. Stand. J. Res., **56**, 343–354 (June 1956)

Samples of cotton, cotton hydrocellulose, and viscose rayon, alone and impregnated with Na_2CO_3 or NaCl, were pyrolysed in a vacuum at 250–397°C. Volatile products were fractionated, and the fractions analysed in a mass spectrometer and by infrared absorption. Volatile fractions consisted mainly of CO_2, CO, water, and tar. The residue consisted mainly of carbon. Impregnation of the cellulose with salts caused a decrease in the yield of tar. Rates of thermal degradation were studied in the temp. range 245–305°C. Plots of rates of loss of weight against percentage loss of weight for the pure cellulosic materials pass through maxima at 13–23% loss and fall gradually. Samples impregnated with salts give very high initial rates of loss of weight. Activation energies of thermal degradation of pure cellulosic materials are much greater than the values for the materials impregnated with salts. W.R.M.

Studies on Viscose. XX— The Dissolution of Cellulose Fibres by Emulsion Xanthation
M. Fujii, T. Kotani, and K. Funatsu
J. Soc. Textile Cellulose Ind. Japan, **12**, 379–384 (June 1956)

Investigations were made on the rate of dissolution of rayon pulp fibres, original and degraded, and the amount of amorphous regions in undissolved fibres in emulsion xanthation. The dissolution process was also observed microscopically. The results are as follows— (*a*) The lower the D.P., the higher the rate of dissolution, and the wider the range of optimum alkali concentration for dissolution. (*b*) The amount of amorphous regions in undissolved fibres increases during xanthation, and is maximum when the alkali concn. is about 10%. (*c*) Although xanthation occurs only at the points of contact of CS_2 droplets with fibres, occasional contacts are sufficient for the progress of xanthation. For this reason viscose formation by simultaneous reaction in emulsion form takes place.
AUTHORS

Application of Electron Microscopy to the Study of the Fine Structure of Regenerated Cellulose Fibres
P. Kassenbeck
Bull. Inst. Text. France, (59), 7–21 (April 1956)

The types of dissymmetry exhibited by viscose rayon fibres are described, and the effects of the composition of the coagulating bath and the spinning stretch on the morphology of the fibres are discussed. The microfissures on the fibre surface shown in electron micrographs are considered to be related to the crystalline structure of the surface layer, in which the cellulose chains are oriented perpendicular to the fibre axis. The behaviour of dissymmetric fibres on wetting is explicable in terms of this structure. J.C.F.

Viscose Rayon Staple in the Carpet Trade— Historical Development and Present Position
C. Schlatter
Textil-Rund., **11**, 403–409 (July 1956)

A general discussion of woven and tufted carpets with notes on carpet cleaning. In the past year in America about 30×10^6 sq. metres of viscose rayon staple carpet was produced. S.R.C.

Aerobic Retting of Flax. II— Microbiological Investigations
T. Madlung and H. Rämsch
Faserforsch. und Textiltech., **7**, 316–323 (July 1956)

Protein Structure in relation to some Desirable Fibre and Fabric Properties
L. Fourt, R. Saxon, and A. M. Sookne
Amer. Dyestuff Rep., **45**, 215, 237–238 (9 April 1956)

Recovery of Wool from Sheepskin Pieces
F. G. Lennox
Chem. and Ind., 382 (12 May 1956)

The common practice of fellmongering in Australia consists in heat-shrinking the skin and then digesting in warm, well aerated water containing calcium. Under these conditions digestion is complete in two days with no putrefaction, but if aeration is insufficient the odour is objectionable and the wool of poor colour. Wool from skin pieces is not dried before scouring. A.J.

Relaxation of Internal Strains in Wool Materials
M. van Overbèke
Teintex, **21**, 497–509 (June 1956)

The causes of internal strains, the methods of dissipation, and factors controlling the release of tensions are discussed. The problem is largely one of manufacture, but for making-up it is virtually impossible to apply a general rule to all wool fabrics regarding relaxation shrinkage. The use of an electric press as the standard method of evaluation is recommended. S.R.C.

Mechanical Behaviour of Wool Fibres. I— Stress Relaxation of Wool Fibres
K. Ishikawa
J. Soc. Textile Cellulose Ind. Japan, **12**, 369–374 (June 1956)

Relaxation curves of wool fibre stretched 10–25% in aqueous media and phenol soln. have been determined. A conditioning temperature of 50°C. was chosen, being as high as can be used without chemically damaging the wool fibre. Conditioning for 30 min. at this temp. between measurements resulted in reproducible relaxation curves, as long as the extension of the fibre did not exceed 30%. A magnetostriction apparatus was constructed for measuring the relaxation of the stretched fibre. The output from the strain-meter was applied to a recording oscillograph for 10 sec. from the start, and after this time the valve voltmeter was read. From the relaxation curves the reciprocal absolute temp. corresponding to

each test and the time required to attain the stress of 3·5–4·75 × 10^8 g./cm.^{2} were obtained. The points for each specified stress were seen to lie on a straight line. From the slope of these lines, the energies of activation for the relaxation process in water were found from each deformation (15, 20, and 25%) to be approx. 10, 20, and 25–30 kcal. respectively. The amount of breaking of hydrogen bonds depends on the concentration of the phenol solution and the temperature. With increasing temp. and phenol concn. the rate of the stress relaxation becomes smaller than under wet conditions. Supplementary measurements of relaxation at various humidities were performed during 0·1–3000 sec. by the former method. Each relaxation curve may be transferred to a logarithmic time scale, and a master relaxation curve may be constructed. AUTHOR

Effect of Heat Treatment on the Physical and Chemical Properties of Wool
G. Mazingue and M. van Overbèke
Bull. Inst. Text. France, (59), 23–40 (April 1956)

Samples of wool were kept at 160°C. for periods up to 30 hr.— (*a*) in dry air, (*b*) in dry nitrogen, and (*c*) in water vapour. All three treatments resulted in a loss in regain of the samples. This loss in regain was proportional to loss in cystine content, and was greatest for (*c*). Yellowing of treated samples was greater in (*a*) and (*b*) than in (*c*). Yellowing was more pronounced for alkaline than for acid samples. Treatment (*c*) produced the greatest fall in resistance to extension. Although the amount of dye taken up by the fibre at equilibrium was not much altered by any of the treatments, rate of dye uptake was greatest for (*c*), for which disulphide bond breakdown was greatest. The amount of dye desorbed in the cold by N-H_2SO_4 also was greatest for (*c*). The practical implications of the findings are discussed. J.C.F.

Sorption of Water by Wool
J. J. Windle
J. Polymer Sci., **21**, 103–112 (July 1956)

A model is proposed in which sorbed water consists of three molecular species— localised water bound to localised sites, mobile water with properties identical with bulk water, and intermediate water with a potential energy of sorption intermediate between those of localised and of mobile water. The theoretical isotherm is derived on statistical grounds and compared with experimental results. Statistical parameters of the model are evaluated, and the distribution of water between the three states is inferred. The nature of the localised sites and the properties of sorbed water are discussed. The model is applied to the interpretation of data on the dielectric behaviour of wool–water systems, the heat of wetting of wool, and the effects of sorbed water on the elastic properties of the fibres. W.R.M.

Influence of Histological Factors on the Attack of the Wool Fibre by Various Reagents
R. L. Elliott and J. B. Roberts
J.S.D.C., **72**, 370–373 (Aug. 1956)

An investigation, including optical and electron microscope studies, of the sequence of attack of various reagents on wool has revealed significant variations in the stability of the histological components of the fibre. In particular, further information has been obtained about the resistant membranes, together with additional evidence of a tubular resistant membrane lying immediately beneath the cuticular layer, and completely surrounding the cortex. Details are given of a new rapid technique for obtaining fibre replicas for electron-microscopic examination. AUTHORS

Molecular Morphology of Silk Fibroin
O. Kratky
Mh. Chem., **87**, 269–280 (April 1956)

X-Ray examination of fresh native silk gel (silk I) revealed two zones, one fitting in with fibrous particles arranged in the α-helix of Pauling *et al.*, the other with corpuscles of mol. wt. > 290,000. After freezing in liquid carbon dioxide and allowing it to warm up again, small, rod-like particles were obtained about 180 A. wide and 45 A. thick. Particles similar to the last were also found in Coleman and Howitt's renatured silk gel. When the latter is dried, diagrams of silk I are obtained. Some progress was made in understanding the fine structure of silk I. H.E.N.

Glyceryl-L-Alanyl Polymer resembling the Crystalline Part of Silk Fibroin
J. Noguchi, M. Asai, T. Hayakawa, and Y. Go
J. Polymer Sci., **21**, 147–150 (July 1956)

Infrared absorption and X-ray diffraction data on poly(glyceryl-L-alanine) resemble those for the crystalline part of silk fibroin and confirm the validity of the molecular model of Meyer and Mark. W.R.M.

Preparation and Properties of Fibres containing Mixed Polymers. III— Polyacrylonitrile–Silk Fibres
D. M. Cates and H. J. White
J. Polymer Sci., **21**, 125–138 (July 1956)

Fibres containing polyacrylonitrile and silk in varying proportions are spun using an aqueous solution of zinc chloride as solvent. Conditions of spinning are discussed. X-Ray diffraction patterns, optical appearance, absorption of water and acid dye, electrical resistivity, and mechanical properties of the fibres are studied. Results suggest that the fibres contain small discrete regions of each polymer, which are neither highly crystalline nor strongly oriented. W.R.M.

Polyvinyl Chloride Fibres. VI— Construction of Master Creep Curves
H. Sobue and M. Takahashi
J. Soc. Textile Cellulose Ind. Japan, **12**, 375–378 (June 1956)

Copolymerisation of Acrylonitrile with Vinyl Acetate and with α-Acetoxyacrylonitrile for Fibre Purposes
H. Reichert and A. Hunyar
Faserforsch. und Textiltech., **7**, 291–296 (July 1956)

Copolymers of acrylonitrile and vinyl acetate can be spun from acetone solution. Textile properties are reasonable, but thermal stability is not satisfactory. Copolymers of acrylonitrile and α-acetoxyacrylonitrile can be spun from dimethylformamide. Thermal stability is satisfactory when the amount of acrylonitrile is not less than 85%. W.R.M.

Studies on the Production of Terephthalic Acid. I— Catalytic Effect of Metal Naphthenates on Autoxidation of *p*-Xylene
N. Ohta
Reports Govt. Chem. Ind. Research Inst., Tokyo, **51**, 215–222 (June 1956)

PATENTS

Fibres from Modified Viscose
Henkel & Cie. *BP* 750,100

Soft, matt fibres of high tenacity are obtained by adding 1–5% of a primary, secondary aliphatic or *cyclo*aliphatic amine to viscose and spinning in the normal way. W.G.C.

Cellulose Propionate and Butyrate Filaments of Good Dimensional Stability at High Temperatures
BrC *BP* 753,461

Filaments of a simple or mixed cellulose ester of propionic or butyric acid of propionyl and/or butyryl value $\leq 25\%$, containing $< 0{\cdot}5$ free OH group for each anhydroglucose and highly crystalline, are stabilised by heating them under conditions such that they do not shrink $> 5\%$. C.O.C.

Acrylonitrile Copolymers of Improved Dyeability
Courtaulds *BP* 749,886

The dyeing affinity of the copolymer of acrylonitrile and an ester of an ethylenically unsaturated acid, e.g. methyl acrylate, is improved by reaction with a quaternary ammonium compound of the type X·R·S$^+$}Y$^-$ (X = NH_2; R = bivalent hydrocarbon group; S = $NR^1R^2R^3$, where R^1, R^2 and R^3 = Alk, or a heterocyclic ring containing N; Y = cation), e.g. β-aminoethyltriethylammonium chloride. W.G.C.

Dyeable Acrylic Fibres
Chemstrand Corpn. *USP* 2,719,834

If non-dyeable polymers or copolymers of acrylonitrile are mixed with polymerised unsaturated halogenoacetic esters, e.g. vinyl chloroacetate, the products are readily dyed with acid dyes. C.O.C.

Colour and Textiles (VIII p. 504)
Behaviour of Dyed and Undyed Textiles on Exposure to Light (VIII p. 504)
Reducing the Water Imbibition of Regenerated Cellulose (X p. 507)

Electron-microscopic Investigation of the Hornification of Cellulosic Fibres (XI p. 507)

Rilsan [11-Nylon], Its Properties and Uses (XIII p. 509)

Judgment of Harshness of Fabrics (XIV p. 509)

Estimation of Thiol Groups in Wool by means of 1-*p*-Chloromercuriphenylazo - 2 - naphthol. I— Intact Fibres (XIV p. 510)

Damage to Wool— Swelling Test in Ammoniacal Potash (XIV p. 510)

Preparation of Fibres from Small Quantities of Protein Solutions (XIV p. 510)

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Alkaline Boiling of Vegetable Fibres

M. P. Kozlov

Tekstil. prom., **16**, 42–46 (June 1956)

A treatment is given of the emulsification theory of kier boiling. It is considered that the surface of a raw cotton fibre is only partly covered with wax (phase 1), which forms hydrophobic patches on a hydrophilic surface (phase 2). If the hydrophobic and hydrophilic areas are equal, the fibre as a whole will have a contact angle against water of $\sim 90°$, as actually observed. When the medium (phase 3) surrounding the fibre is air, then, on the assumption that the system is in equilibrium at the m.p. (70–85°c.) of the wax, the interfacial tensions (σ) are related by the equation—

$$\sigma_{2,3} = \sigma_{1,2} + \sigma_{1,3}\cos(180° - \theta)$$

(θ is the angle between the exposed hydrophilic surface and the wax surface at the point of contact); the wax then forms a very flat drop ($\theta \sim 180°$). When air is replaced by hot water, $\sigma_{1,2}$ becomes considerably less than the sum of the opposing forces, so that θ diminishes and the area of contact between the melted wax and the fibre diminishes. Correspondingly, it is found that, when loom-state cotton fabric is immersed for 10–15 min. in water at 97–99°c. and then dried in air at 20°c., it becomes readily wettable. In such a process neither disruption of the primary wall— as postulated by Rostovtsev (see J.S.D.C., **68**, 38 (1952))— nor appreciable removal of wax or pectic substances can occur. When the water contains also surface-active substances, the perimeters of the drops of wax can be reduced still further and, with the formation of a unimolecular layer of surface-active substance on the wax, a "wedging" process can come into operation, resulting in the extension of the layer between the wax and the hydrophilic substrate and possibly in the complete removal of the drop of wax. So long as the area of contact between wax and fibre is reduced sufficiently and the state so obtained can be adequately stabilised, a hydrophilic fibre can be obtained without removing much of the wax— some technical bleaching processes do, in fact, produce absorbent cotton of high wax content. If, however, the fibre is treated in a non-polar liquid— such as benzene, for which $\sigma_{2,3}$ is estimated to be approx. equal to $\sigma_{1,2}$— there is no tendency for the perimeter of the drop to diminish, and, although benzene has a solvent action on the wax and most of the wax may be removed, the area of hydrophobic surface remains unchanged and the fibre as a whole remains hydrophobic; this explains the non-absorbency of solvent-extracted cotton, as observed by Rostovtsev (*loc. cit.*) and others. The treatment is made roughly quantitative by assuming values for the interfacial tensions derived from data for systems considered to be analogous to the system under discussion. It is pointed out that these treatments of some of the physical aspects of kier boiling give only a part of the picture, and must be supplemented by treatments of the hydrodynamic and chemical processes occurring.

An editorial note states that some of the views of the late M. P. Kozlov are controversial, and discussion is invited. A.E.S.

Studies on Semi-chemical Pulp. II— Bleaching of Semi-chemical Pulp

I. Shimoda, J. Sato, and Y. Ōbuchi

J. Soc. Textile Cellulose Ind. Japan, **12**, 385–391 (June 1956)

Potentiometric Investigation of Chlorite Solutions

I. E. Flis and T. M. Vasil'eva

J. Gen. Chem. U.S.S.R., **26**, 1272–1277 (May 1956)

Chlorite soln. are titrated with acid and then back-titrated with alkali, either immediately or after 4 or 16 hr. Simultaneous pH and redox potential measurements are made on the soln. It is shown that appreciable formation of ClO_2 in acid soln. begins at pH 6. Comparison is made with the behaviour of hypochlorite soln., and the results indicate that in the usual pH ranges for bleaching (9·5–10·5 for hypochlorite and 3·5–6 for chlorite) the oxidising powers of the soln. are approx. equal. A.E.S.

Bleaching with Sodium Chlorite

M.-J. Mouton

Teintex, **21**, 377–425 (May), 473–497 (June), 544–571 (July 1956)

Stabilisers, wetting agents, and catalysts are discussed, and the advantages of sodium chlorite are weighed against those of other bleaching agents. The plant and the materials necessary for chlorite bleaching, and the effect of various metals on decomposition rate, are examined in detail. Practical recipes are then given for cotton and viscose rayon, cellulose acetate and linen in various forms, and mixtures, continuous processes being included. Treatments for bleaching man-made fibres, incorporating chlorite-stable fluorescent brightening agents, are also discussed. S.R.C.

Sodium Silicate as Stabiliser in Peroxide Bleaching

A. Sigg

Textil-Rund., **11**, 391–402 (July 1956)

The stabilising effect appears to occur in combination with Ca or Mg, and under adverse conditions silicate deposits may remain in the goods. To prevent this, the use of water of 2–5° German hardness, correct rinsing, and a definite NaOH–water-glass mixture (x c.c. of 38° Bé. water-glass + $\frac{1}{4}x$ c.c. of 36° Bé. NaOH) are recommended. The first rinse must be with warm soft water: hard, cold, or acid water in rinsing gives a harsh handle. A sequestering agent in the rinse is particularly effective, but such products must be excluded from the bleaching bath, since they interfere with the action of the alkaline-earth silicates. In peroxide–steam continuous bleaching of cotton, sufficient alkaline earths are present for satisfactory silicate stabilisation, but again a definite $Na_2O : SiO_2$ ratio must be maintained. Small additions of sodium tripolyphosphate assist in reducing silicate residues in the goods to a minimum, without interfering with Ca or Mg. S.R.C.

PATENTS

Bleaching Cellulose Pulp

Food Machinery & Chemical Corpn. *BP* 753,769

Uniform bleaching is obtained if the sheets of pulp are impregnated with alkali and then with hydrogen peroxide. C.O.C.

Bleaching Cellulosic Textiles

Deutsche Gold- und Silber-Scheideanstalt vormals Roessler *BP* 752,381

Modification of *BP* 738,903 (J.S.D.C., **72**, 36 (Jan. 1956)). Good results are obtained by using the bleaching bath either cold or not above 60°c., freeing the material from excess liquor, and steaming so as to heat it to $\geqslant$ 100°c. immediately before it passes into the ager. C.O.C.

Peroxygen Bleaching of Nylon

DuP *USP* 2,720,441

The nylon is treated in an aqueous bath containing a peroxygen compound and an aliphatic carboxylic acid of dissociation constant at 25°c. 10^{-3}–10^{-4}, e.g. acetic acid. C.O.C.

Bleaching Polyacrylonitrile Fibres

DuP *USP* 2,720,440

Excellent results are obtained by treatment with performic acid or hydrogen peroxide in conc. formic acid, i.e. $\leqslant$ 75% by weight. C.O.C.

Viscose Rayon Staple in the Carpet Trade— Historical Development and Present Position (VI p. 501)

Use of Silicones by Dry Cleaners for Waterproofing Garments (X p. 506)

Evaluation of Bacteriostatic Reagents, and Methods of Application to Textile Fabrics (XIV p. 511)

VIII— DYEING

Colour and Textiles

I— Experiments in Colour

P. Warburton and G. V. Lund

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Reasons for eye fatigue and the formation of after-images are explained, and a comprehensive series of experiments is carried out in which the opinions of ten observers on the hue and value changes caused by juxtaposition of different colours are examined. The effect of viewing distance is also studied. It is concluded that difference of value is a more important factor than difference of hue in the modification of the general appearance of associated colours. Changes of hue will always occur when small units of colour are viewed, being due to a fusion or partial fusion of the coloured lights reflected from the units of design. Maximum changes in hue are caused by juxtaposition of colours situated at an angle of 90° in the colour circle. Slight changes may be expected when neighbouring colours are used, with some loss of colour saturation with near-complementary colours. Large areas of complementary colours appear to enhance each other without changing the hue of the colours, but as the units decrease in size the colours may be changed in value and saturation, and will often appear lighter or greyer. Of the Chevreul, Munsell, Carpenter, and Ostwald colour circles, the disposition of colours in the Ostwald and Munsell gives the most acceptable list of complementary colours. Distance of viewing can have a profound effect on appearance of colour combinations, and when identical colour units of different sizes are spaced to subtend the same angle at the eye, the modification is the same. Designers should use colours which appear pleasant at all distances. However, if fabrics are always to be viewed from some distance, e.g. stage design, attractive luminous multicolour effects may be obtained by the suitable use of a small number of basic colours.

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$$L = 14 - \frac{10{,}800}{4000 - \lambda_1}$$

where λ_1 is the wavelength in A. of the light-absorption maximum nearest to but below 3230 A. It had been found that light of 3230–4000 A., even if absorbed, does not destroy dyes, but light of about 4000–4771 A. bleaches dyes again. It has now been discovered that light of wavelength $<$ 3230 A. and 4000–4771 A. retards growth, but light of 3230–4000 A. and $>$ 4771 A. accelerates growth up to ten times. H.E.N.

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Dr. Schaeffer

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A comprehensive review of the literature covering the following subjects— general observations on the action of light on textiles, alteration in dye constitution on the fibre on exposure with special reference to vat dyes, changes in fibres on exposure, influence of dyes on fibre degradation, methods of improving the light fastness of dyeings, and fibre-protective agents. 158 references to the literature are given. B.K.

Fading of Dyeings by Weathering

J. P. Niederhauser

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Dyeings were exposed to natural weathering conditions and in the Weatherometer. In general, fading is much more rapid under weathering conditions than by light alone, and there appears to be no constant relation between the two conditions. The usual range of blues used for light fading change too rapidly for weathering standards. It is difficult to codify weathering fastness, especially in view of the different results obtained at different stations and during different seasons. Practical tests of any given pattern are necessary over a wide range of conditions. S.R.C.

Factors influencing the Successful Application of Direct Dyes

E. M. Taylor

Amer. Dyestuff Rep., **45**, P 381–P 384 (4 June 1956)

Dyeing of Cellulose Acetate

M. Kusunose and K. Odajima

I— Dyeing Properties of Cellulose Acetate and their Thermodynamic Treatment

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The application of thermodynamics to the dyeing of cellulose acetate with disperse dyes is discussed, and it is shown that the entropy term and the energy term govern the equilibrium of dyeing, while the equilibrium of dyeing is determined by chemical potential generally. Hence, on a thermodynamic basis—

$$K_c = \frac{[D]_f}{[D]_s} \cdot V = \frac{e^{\Delta S}}{e^{-\Delta H/RT}}$$

(K_c = equilibrium constant; $[D]_f$ = concn. of dye in the fibre phase at equilibrium; $[D]_s$ = concn. of dye in the dyebath at equilibrium; V = volume of the fibre phase dyed; ΔS = change of entropy at equilibrium; ΔH = change of energy at equilibrium; and R = gas constant). Then, from the linear relationships on the graph of $\ln K_c$ against $1/T$ in experiments with Fenacet Fast Blue FFN and Fenacet Fast Red 2G, it was found that the tangent of the former is positive and that of the latter negative, and it was presumed that there may be a considerable difference between their mechanisms of dyeing from the standpoint of the reversal of positive and negative signs of their thermodynamic quantities. The increasing entropy effect

was given to the former, while hydrogen bonds affect the latter.

II—Influences of the Second-order Transition Point of Fibres upon the Dyeing Properties of Cellulose Acetate

There are two lines on the graph of $\ln [D]_f/[D]_s$ against $1/T$, which are inclined toward each other or jump at the transition point 68°C., and it is presumed that this may be on account of the transition phenomenon of the fibre. It is found that with Fenacet Fast Blue FFN and Fast Red 2G, the values of the energy and the entropy of dyeing increase to the positive sign above the temp. of the transition point 68°C. in the former, and on the other hand increase to the negative sign in the latter. AUTHORS

Effect of Solvents on Wool Dyeing

M. Kärrholm and J. Lindberg

Text. Research J., **26**, 528–530 (July 1956)

The effect on the rate of uptake of acid dyes by wool of adding amyl alcohol to the bath is related to the partition ratio of dye between alcohol and water. Thus, for a series of dyes differing only in degree of sulphonation, the addition of 3% amyl alcohol reduced the time of half-dyeing at 60°C. by factors of 10, 4, and 1 respectively for mono-, di-, and tri-sulphonated dyes, whilst the corresponding partition ratios (alcohol/water) were 1, 0·25, and 0. With 1:2 chrome-complex dyes containing no sulpho groups the effect of adding amyl alcohol is even greater than with monosulphonated acid dyes. Thus with Cibalan Blue BL the time of half-dyeing is reduced by a factor of 100. If, however, the surface of the fibre is modified by treatment with NaOH in butanol–kerosene, the effect of adding amyl alcohol is much reduced. The increased hydrophilic character of the surface presumably modifies the adsorption characteristics for the alcohol. Microscopic examination of dyed fibres shows that in the presence of butyl and amyl alcohols dye distribution is more uniform between fibres and between different parts of the same fibre. This method of dyeing possesses important possibilities, not only for low-temperature dyeing, but also for high-temperature continuous dyeing, where fibre-to-fibre levelness is of great importance. J.C.F.

Photochemistry of Dyes on Proteins and other Substrates

J. W. Cumming, C. H. Giles, and Miss A. E. McEachran

J.S.D.C., **72**, 373–381 (Aug. 1956)

The rates of oxidation and of reduction in aqueous solution, and of fading in films of a typical protein (gelatin) and a typical non-protein (methylethylcellulose), have been determined for several series of dyes of different chemical classes. The general conclusion reached is that the photodegradation of a dye may follow either of the alternative mechanisms of oxidation or reduction, but normally oxidation occurs more readily on all non-proteins and reduction on proteins. In photochemical oxidation of dyes on non-proteins the substrate does not necessarily take part directly, but in reduction on proteins some constituent of the protein itself appears to act as the reducing agent. The histidine side-chains are probably the active constituent. AUTHORS

Dyeing of Nylon with Acid Dyes. II—Kinetics of the Process

E. Atherton and R. H. Peters

Text. Research J., **26**, 497–517 (July 1956)

The rates of uptake by nylon of nine acid dyes and twenty-one binary mixtures of these dyes have been determined under infinite-dyebath conditions. The results have been interpreted in terms of a modified diffusion equation based on the assumption that the rate of transfer of dye through the fibre is proportional to the activity gradient of the dye. The ratio of the rates of uptake of the dyes in a binary mixture is controlled by the affinities, diffusion coefficients, basicities, and concentrations of the dyes, but is independent of time. The results obtained agree with these deductions and allow the calculation of affinity differences between pairs of dyes. The constant uptake ratios obtained are in contrast with the incompatibilities observed under practical dyeing conditions. This is considered to be due to the short liquor ratios and low dye concentrations used in practice. J.C.F.

Application of Vat Dyes to Acrilan and to Acrilan–Rayon Blends

E. D. Smith and W. H. Hindle

Amer. Dyestuff Rep., **45**, P 413–P 415 (18 June 1956)

Application of vat dyes to Acrilan is briefly discussed. It is emphasised that, if properly applied, they are even faster to light and washing than on cotton or rayon. A preliminary report is given on laboratory work concerning application to Acrilan–rayon blends. J.W.B.

PATENTS

Fugitive Tinting of Nylon

ICI *BP* 753,487

Use of a quaternary ammonium salt of an acid dye in presence of a non-ionic dispersing agent gives an efficient tinting which is completely removed during scouring. C.O.C.

Dyeing Acrylonitrile Polymers and Copolymers with Acid Dyes

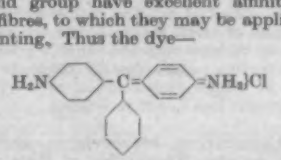
Courtaulds *BP* 751,865

Addition to the dyebath of a long-chain cation-active quaternary ammonium salt, e.g. cetyltriethylammonium *p*-toluenesulphonate, imparts increased affinity for acid dyes. C.O.C.

Dyeing and Printing Polyacrylonitrile Textiles

Ciba *BP* 752,684

Triarylmethane dyes containing one or two primary amino groups *para* to the central C atom but having no sulphonic acid group have excellent affinity for polyacrylonitrile fibres, to which they may be applied by either dyeing or printing. Thus the dye—



dyes polyacrylonitrile fibres from an acetic acid bath a brilliant violet of remarkable fastness to light and excellent fastness to washing and milling. It gives excellent prints from a paste containing formic acid, tartaric acid and gum arabic thickening. C.O.C.

Properties of Textile Materials. V—The Action of Light on Textile Materials (VI p. 500)
Camouflage Material (XIII p. 509)
Differential Dyeing as Method for studying the Diffusion and Absorption of Direct Dyes in Viscose Rayon Fibres—I (XIV p. 511)
High-temperature Dyeometer—An Instrument for studying Colour Reactions at Elevated Temperatures (XIV p. 511)

IX—PRINTING

PATENTS

Simultaneous Embossing and Printing

K. P. Reimann *BP* 752,956

The design is formed in relief in the wire of the outer surface of an endless wire screen which passes around a heated cylinder. An endless blanket for part of its passage is pressed against part of the wire screen around the cylinder. Ink is supplied to the screen. The material to be printed and embossed is passed between the blanket and the screen. C.O.C.

Reducing Highlight Stain in Colour Photographs made by the Silver-Dye-Bleach Process

Ilford *BP* 752,923

Dyeing and Printing Polyacrylonitrile Textiles (VIII above)
Fur Dressing and Dyeing (XII p. 508)
Camouflage Material (XIII p. 509)

X—SIZING AND FINISHING

Present State of Textile Finishing

H. Tulo

Tintorería industrial, (15), 143–176 (1956)

A review of crease-resist, permanent glazing and embossing, and other wash-fast finishes based on synthetic resins. S.R.C.

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Effect of Solvents on Wool Dyeing

M. Kärrholm and J. Lindberg

Text. Research J., **26**, 528–530 (July 1956)

The effect on the rate of uptake of acid dyes by wool of adding amyl alcohol to the bath is related to the partition ratio of dye between alcohol and water. Thus, for a series of dyes differing only in degree of sulphonation, the addition of 3% amyl alcohol reduced the time of half-dyeing at 60°C. by factors of 10, 4, and 1 respectively for mono-, di-, and tri-sulphonated dyes, whilst the corresponding partition ratios (alcohol/water) were 1, 0·25, and 0. With 1:2 chrome-complex dyes containing no sulpho groups the effect of adding amyl alcohol is even greater than with monosulphonated acid dyes. Thus with Cibalan Blue BL the time of half-dyeing is reduced by a factor of 100. If, however, the surface of the fibre is modified by treatment with NaOH in butanol–kerosene, the effect of adding amyl alcohol is much reduced. The increased hydrophilic character of the surface presumably modifies the adsorption characteristics for the alcohol. Microscopic examination of dyed fibres shows that in the presence of butyl and amyl alcohols dye distribution is more uniform between fibres and between different parts of the same fibre. This method of dyeing possesses important possibilities, not only for low-temperature dyeing, but also for high-temperature continuous dyeing, where fibre-to-fibre levelness is of great importance. J.C.F.

Photochemistry of Dyes on Proteins and other Substrates

J. W. Cumming, C. H. Giles, and Miss A. E. McEachran

J.S.D.C., **72**, 373–381 (Aug. 1956)

The rates of oxidation and of reduction in aqueous solution, and of fading in films of a typical protein (gelatin) and a typical non-protein (methylethylcellulose), have been determined for several series of dyes of different chemical classes. The general conclusion reached is that the photodegradation of a dye may follow either of the alternative mechanisms of oxidation or reduction, but normally oxidation occurs more readily on all non-proteins and reduction on proteins. In photochemical oxidation of dyes on non-proteins the substrate does not necessarily take part directly, but in reduction on proteins some constituent of the protein itself appears to act as the reducing agent. The histidine side-chains are probably the active constituent. AUTHORS

Dyeing of Nylon with Acid Dyes. II—Kinetics of the Process

E. Atherton and R. H. Peters

Text. Research J., **26**, 497–517 (July 1956)

The rates of uptake by nylon of nine acid dyes and twenty-one binary mixtures of these dyes have been determined under infinite-dyebath conditions. The results have been interpreted in terms of a modified diffusion equation based on the assumption that the rate of transfer of dye through the fibre is proportional to the activity gradient of the dye. The ratio of the rates of uptake of the dyes in a binary mixture is controlled by the affinities, diffusion coefficients, basicities, and concentrations of the dyes, but is independent of time. The results obtained agree with these deductions and allow the calculation of affinity differences between pairs of dyes. The constant uptake ratios obtained are in contrast with the incompatibilities observed under practical dyeing conditions. This is considered to be due to the short liquor ratios and low dye concentrations used in practice. J.C.F.

Application of Vat Dyes to Acrilan and to Acrilan–Rayon Blends

E. D. Smith and W. H. Hindle

Amer. Dyestuff Rep., **45**, P 413–P 415 (18 June 1956)

Application of vat dyes to Acrilan is briefly discussed. It is emphasised that, if properly applied, they are even faster to light and washing than on cotton or rayon. A preliminary report is given on laboratory work concerning application to Acrilan–rayon blends. J.W.B.

PATENTS

Fugitive Tinting of Nylon

ICI *BP* 753,487

Use of a quaternary ammonium salt of an acid dye in presence of a non-ionic dispersing agent gives an efficient tinting which is completely removed during scouring. C.O.C.

Dyeing Acrylonitrile Polymers and Copolymers with Acid Dyes

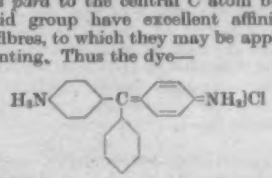
Courtaulds *BP* 751,865

Addition to the dyebath of a long-chain cation-active quaternary ammonium salt, e.g. cetyltriethylammonium *p*-toluenesulphonate, imparts increased affinity for acid dyes. C.O.C.

Dyeing and Printing Polyacrylonitrile Textiles

Ciba *BP* 752,684

Triarylmethane dyes containing one or two primary amino groups *para* to the central C atom but having no sulphonic acid group have excellent affinity for polyacrylonitrile fibres, to which they may be applied by either dyeing or printing. Thus the dye—



dyes polyacrylonitrile fibres from an acetic acid bath a brilliant violet of remarkable fastness to light and excellent fastness to washing and milling. It gives excellent prints from a paste containing formic acid, tartaric acid and gum arabic thickening. C.O.C.

Properties of Textile Materials. V—The Action of Light on Textile Materials (VI p. 500)
Camouflage Material (XIII p. 509)
Differential Dyeing as Method for studying the Diffusion and Absorption of Direct Dyes in Viscose Rayon Fibres—I (XIV p. 511)
High-temperature Dyeometer—An Instrument for studying Colour Reactions at Elevated Temperatures (XIV p. 511)

IX—PRINTING

PATENTS

Simultaneous Embossing and Printing

K. P. Reimann *BP* 752,956

The design is formed in relief in the wire of the outer surface of an endless wire screen which passes around a heated cylinder. An endless blanket for part of its passage is pressed against part of the wire screen around the cylinder. Ink is supplied to the screen. The material to be printed and embossed is passed between the blanket and the screen. C.O.C.

Reducing Highlight Stain in Colour Photographs made by the Silver-Dye-Bleach Process

Ilford *BP* 752,923

Dyeing and Printing Polyacrylonitrile Textiles (VIII above)
Fur Dressing and Dyeing (XII p. 508)
Camouflage Material (XIII p. 509)

X—SIZING AND FINISHING

Present State of Textile Finishing

H. Tulo

Tintoreria industrial, (15), 143–176 (1956)

A review of crease-resist, permanent glazing and embossing, and other wash-fast finishes based on synthetic resins. S.R.C.

New Process for compacting Textile Materials
W. J. Hamburger and K. R. Fox

I—Research and Development
Text. Research J., **26**, 441–448 (June 1956)

A new type of mechanical finishing treatment is described. Fabric is fed between two rollers revolving at different speeds. At a short distance before the nip the fabric is also nipped against the faster moving roller by an adjustable metal plate. The short length of fabric between the nips is subjected to compressive forces, which produce a decrease in length of the fabric and an increase in its thickness.

II—Industrial Applications
Ibid., 448–454

The commercial development of the compacting machine is outlined, and results are given of shrinkage tests on compacted and control fabrics made from cotton, blends of synthetic fibres, wool and blends of wool with synthetic fibres, and on yarns. Other potential uses of the machine are discussed. J.C.F.

Cellulose–Sodium Hydroxide–Water System in the Cyanoethylation of Cotton Cellulose
J. W. Weaver, E. Klein, B. G. Webre, and E. F. DuPré
Text. Research J., **26**, 518–523 (July 1956)

In the cyanoethylation of cotton with a large excess of acrylonitrile in the presence of aqueous alkali at fixed time and temperature, the extent of reaction and by-product formation is controlled by the ratios cellulose : NaOH : H_2O. Variation of these ratios allows the preparation of cyanoethylated cottons with the same N content but with different properties. High NaOH contents lead to the introduction of a high proportion of carboxyethyl groups with a consequent loss in rot resistance. J.C.F.

Effects of Laundering, Mercerising, and Simulated Vat Dyeing on the Properties of Partially Cyanoethylated Cotton
R. M. Reinhardt, A. R. Markezich, H. B. Moore, and J. D. Reid
Text. Research J., **26**, 423–429 (June 1956)

Cotton sheetings cyanoethylated to N contents varying from 2·2 to 6·4% were subjected to laundering, mercerising, and simulated vat-dyeing treatments. Samples were analysed for thread count, weight, and thickness, and tested for breaking strength, elongation, tearing strength, abrasion resistance, air permeability, stiffness, regain, and resistance to rot, heat, and creasing. None of the three treatments had any serious effect on the properties tested, except for loss of rot-resistance for samples with N contents $< 4\%$. J.C.F.

Preparation of a Partial Ester of Cotton Cellulose in Fabric Form
A. L. Bullock, W. T. Schreiber, and J. D. Guthrie
Text. Research J., **26**, 340–341 (May 1956)

A partial capric ester of cotton cellulose in fabric form has been prepared by soaking cotton fabric in pyridine and then treating with capric anhydride at 110°c. Under these conditions the cellulose is not significantly degraded. The treated fabric, which had a capryl content of 6·6%, showed considerably greater water repellency than ordinary bleached cotton and some degree of rot resistance. J.C.F.

Infrared Spectroscopy of Urea–Formaldehyde Products
H. J. Becher

I—Methyleneureas
Chem. Ber., **89**, 1593–1601 (July 1956)

By comparing the infrared absorption of dimethylenetriurea (I) with that of urea and methylenediurea and by observing the changes brought about by deuteration, it is shown that the grouping $-CH_2\cdot N(CO\cdot NH_2)\cdot CH_2-$ is absent. The spectrum of trimethylenetetraurea is very similar to that of I and it also must be in the straight-chain form. To interpret the spectrum of impure pentamethylenehexaurea (II) some branching of the chain is postulated. The spectrum of polymethylenepolyurea, produced from mol. proportions of paraformaldehyde and urea by heating finally at 130°c. *in vacuo*, gave evidence of greater chain length than II and none of the presence of new groupings such as rings.

II—Hydroxymethyl- and Hydroxymethylmethylene-ureas
Ibid., 1951–1959 (Aug. 1956)

The infrared absorption spectra of monomethylolurea, before and after deuteration, are compared and most of the frequencies assigned. The spectra of normal and deuterated dimethylolurea cannot be interpreted completely, but lead to the conclusion that the molecule must be symmetrical, i.e. *NN'*-dimethylolurea. The spectra of monomethylolmethylenediurea and dimethylolmethylenediurea (I) show that both carry methylol groups on the free amino groups of methylenediurea, I one on each. The same applies to mono- and di-methyloldimethylenetriurea. Some condensation products from urea and excess of formaldehyde in weakly acid soln. at pH ~ 5 and room temp. are examined. The ppt. (II) formed in 80 min. gives a spectrum similar to that of a polymethylenepolyurea, methylol groups not being detectable. II appears to have a limited molecular size of about 6–7 methylene bridges. In products of longer times of condensation the presence of methylene-ether links is suggested. The separation of II enriches the relative concn. of formaldehyde in soln., so that further enlargement through methylene-ether bridges is favoured and becomes dominant. The filtrate after a condensation time of 110 min., on neutralisation with $NaHCO_3$, slowly yields a ppt. which from its infrared spectrum appears to consist mainly of I and dimethyloldimethylenetriurea. H.E.N.

Urea–Formaldehyde Crease-resistant Finish. VIII—Picolinemonochloroacetic Acid as Catalyst
M. Hida
J. Soc. Textile Cellulose Ind. Japan, **12**, 412–417 (June 1956)

Picolinemonochloroacetic acid is an excellent latent catalyst for the crease-resistant finish with urea–formaldehyde resin, and the method has been patented. The effects of baking conditions, concn. of resin soln., composition and amounts of catalyst, and the times of standing of resin soln. have been studied. The method can be applied on the industrial scale. AUTHOR

Silicones in the Textile Industry
R. A. Ford
Amer. Dyestuff Rep., **45**, P 377–P 380 (4 June 1956)

The properties of silicone finishes are reviewed, with regard to handle, soil resistance, stain removal, wear resistance for wool, and reduction of the felting shrinkage of wool. A silicone emulsion and catalyst have been developed which, by balancing the "electro-potential" of the silicone emulsion–catalyst combination to that of fabrics containing at least 85% wool, will exhaust selectively on the wool. Padding equipment is thus unnecessary. J.W.B.

Use of Silicones by Dry Cleaners for Waterproofing Garments
M. Morel
Teintex, **21**, 282–291 (April 1956)

Fluorine and Iodine Compounds as Flame-retardants for Cotton
J. G. Frick, J. D. Reid, and H. B. Moore
Text. Research J., **26**, 525–528 (July 1956)

The effectiveness of certain inorganic (metal halides) and organic compounds of fluorine and iodine as flame-retardants for cotton has been examined. The organic fluorine compound was a polymerised allyl trifluoroethyl phosphate, and the iodine compound a phosphate polyester with iodine-containing groups. Comparison with other halogenated compounds shows that, on an equal-weight basis, the order of effectiveness of the halogens is: $F < Cl < Br \simeq I$. From practical considerations, bromine appears to be the most effective halogen for use in flame-retardants for cotton. However, the lower cost of chlorine may offset its lower efficiency. J.C.F.

PATENTS

Rendering Cellulose Fibres readily Wettable
S *BP* 751,658

Cellulose fibres treated at > 75°c. in an alkaline bath containing a compound of formula—

$$R\cdot[O\cdot C_2H_4]_n\cdot O\cdot CH_2\cdot COOM$$

(R = Alk of 8–20 C or alkaryl or 8–25 C; $n > 1$; M = cation), e.g. sodium oleyl-dodecaglycol-hydroxyacetate, become highly wettable and do not lose this property

when rinsed, boiled, mercerised, or bleached. Thus addition of such compounds in kier boiling renders use of wetting agents unnecessary in subsequent wet processing, e.g. in mercerising or dyeing. C.O.C.

Reducing the Water Imbibition of Regenerated Cellulose
Courtaulds *BP* 750,088

The water imbibition of regenerated cellulose is reduced by treating in presence of moisture with the vapour of ammonia, hydrazine hydrate, or an "alkyl primary amine" of mol.wt. < 74; e.g. viscose rayon staple of 13% moisture regain is treated at −15°C. with ammonia under 1·5 atmospheres pressure for 105 min. W.G.C.

Continuous Production of Curled Elastic Threads and Yarns from Thermoplastic Threads
N.V. Onderzoekingsinstituut Research *BP* 750,761

Curled elastic threads are continuously produced from smooth straight thermoplastic threads or yarn, particularly those produced from synthetic polymerisation or polycondensation products, by taking the thread off by a conveyor device at a uniform speed through a hot air zone. It passes through a cooling device and then through a false-twisting device, which delivers the thread in a ballooning way. The conveyor is situated after the twister and the tension is regulated at a uniform and low level before the twister. Cooling may be effected by a directed stream of air. J.W.B.

Impregnating Tyre Cords with Synthetic Resins
Dunlop Rubber Co. *BP* 753,857

Yarn is impregnated with a phenol, formed into a cord and then treated with an aldehyde to form a resin *in situ*. This yields cords which are evenly and effectively impregnated with the resin. C.O.C.

Permanent Setting of Keratinous Fibres
Unilever *BP* 753,241

An aqueous solution containing a reducing agent for keratin, an ionisable ingredient to bring the mixture to pH > 7 and a polysiloxane is used as a cold permanent-waving solution which does not tend to overprocess the hair. C.O.C.

Resin Finish to render Wool-containing Textiles Dimensionally Stable
Rohm & Haas Co. *USP* 2,719,072

The material is impregnated with a mixture of 3–8% of ureidoethyl acrylate, CH_2:$CHCOOC_2H_4NHCONH_2$, and/or ureidoethyl methacrylate and 97–92% of alkyl acrylates or methacrylates of formula—

$$CH_2{:}CR^1{\cdot}COOR^2$$

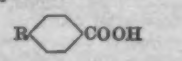
(R^1 = H or CH_3; R^2 = straight- or branched-chain Alk of 1–8 C), the mixture being applied as an aqueous emulsion. The impregnated materials are dried and then baked at < 240°F. to cause reaction between the copolymer and the fibres. The resultant finish is fast to laundering and dry cleaning. C.O.C.

Setting Acetate Rayon Yarn
Adshead & Geeson *BP* 752,466

The yarn is first passed through steam, then through hot dry air and finally in contact with a surface at 285°F. or above. C.O.C.

Antistatic Treatment of Terylene
Vereinigte Glanzstoff-Fabriken *BP* 754,054

The Terylene is treated with a neutral or acid triethanolamine salt of a compound of formula—



(R = H or OH) or an *o*- or *m*-dicarboxylic acid of benzene, either alone or together with polyvinyl alcohol. This gives an exceptionally effective antistatic finish while retaining a dry handle. C.O.C.

Water-repellent Finish
Midland Silicones *BP* 753,730

The material is treated with the co-hydrolysis product of 65–95 mol. % of $(CH_3)_2SiX_2$ and 35–5 mol. % of $HSiX_3$ (X = Cl or alkoxy) and then heated at above 100°F. Thus wool, polyacrylonitrile, Terylene, vinyl chloride–vinylidene chloride fibres or paper are treated for 5 sec. in a solution of the co-hydrolysate of a mixture of 80 mol. % of $(CH_3)_2Si(OC_2H_5)_2$ and 20 mol. % of $HSi(OC_2H_5)_3$, passed through rubber squeeze rolls and heated for 18 min. at 150°C. C.O.C.

Coating Glass Fibres with Vinyl- or Allyl-silanes
Libby-Owens-Ford Glass Co. *BP* 754,158

Glass fibres are made more receptive for synthetic resin by treating them with an aqueous solution of a hydrolysed vinyl- or allyl-silane of pH 4·5–7·5 and drying in absence of circulating air currents. The treated cloth is exceptionally soft. C.O.C.

Modified Polytetrafluoroethylene-coated Heat-resistant Fabric
DuP *BP* 753,927

A heat-resistant fabric, e.g. glass-fibre fabric, is coated or impregnated with an aqueous suspension containing polytetrafluoroethylene and cryolite and is then heated to < 621°F. This gives a tear-resistant fabric, resistant to very high temperatures, abrasion and all known solvents. C.O.C.

Mechanical Finishing of Flexible Sheets of Fully Synthetic Thermoplastic Material
Cilander *BP* 752,074

Before or after being hot mechanically finished, the material is delustred by treatment with solvents or swelling agents so as to modify only the surface of the material or at most only slightly alter its structure. Thus a dyed nylon toile is embossed at 140°C., and then treated for 5 sec. in 28·5° Bé. H_2SO_4 at 15°C., hot rinsed and washed well. The resultant cloth has raised brilliant portions standing out clearly from the matt background, there is also a coloured pattern as the portions not embossed are markedly brightened by the matting treatment. C.O.C.

Embossing
Bradford Dyers' Assocn. *BP* 752,192

The material to be embossed is heated while it passes through the nip formed by a belt of resilient material bearing the design and a smooth rigid roller. C.O.C.

Ruffle Finish
Bleachers' Assocn. and Bradford Dyers' Assocn. *BP* 752,191

Part of the material is shrunk in relation to another part by frictional compressional shrinking, the part which is not so treated being free to deform so that it forms into ruffles while the treated part remains flat. C.O.C.

Compositions for reducing Keratin (III p. 493)
Simultaneous Embossing and Printing (IX p. 505)
Camouflage Material (XIII p. 509)

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Some Fractionations of the Portions of Wood-pulp Cellulose soluble in Aqueous Sodium Hydroxide
T. N. Kleinert, V. Moessmer, and W. Wincor
Mh. Chem., **87**, 82–86 (Feb. 1956)

The β- and γ-celluloses from pine and beech were nitrated. The acetone-soluble portions consist mainly of hexosans, the insoluble portions of pentosans and polyuronic acids. The acetone-insoluble portion is greater with γ- than with β-celluloses, that for beech being particularly high. Viscosity measurements indicate a D.P. of up to 200 for the β-celluloses, but of < 20 for the γ. H.E.N.

Electron-microscopic Investigation of the Hornification of Cellulosic Fibres
G. Jayme and G. Hunger
Mh. Chem., **87**, 8–23 (Feb. 1956)

The decrease in the water-absorbing power of cellulose occurring when wood pulp is dried is termed an irreversible "hornification". It is shown by means of electron-microscopy that this process is due to the joining up of the individual microfibrils into ribbons. H.E.N.

Structure and Properties of Cellulose. LVI—Comparative Reactivities of the Hydroxy Groups of Cellulose. Distribution of Methoxy Groups in the Product of Partial Methylation of Cellulose under Alkaline Conditions
V. Derevitskaya, Yu. Kozlova, and Z. Rogovin
J. Gen. Chem. U.S.S.R., **26**, 1466–1471 (May 1956)

Alkali cellulose is prepared from various types of cellulose, washed free from loosely held alkali with anhyd.

butyl alcohol, and methylated with methyl iodide or sulphate. The degree of substitution γ (equiv. of substituent per 100 repeating units) of the methylcellulose (γ_{Me}) is never greater than γ_{Na} for the alkali cellulose (~ 120). It appears that methylation proceeds by replacement of bound sodium—γ_{Me} attains the value of ~ 100 in one methylation treatment and then slowly approaches γ_{Na} as further treatments are given. Primary hydroxyls are determined by tritylation and by esterification with nitric acid and replacement of esterified primary hydroxyl by iodine; the two methods give closely agreeing results. α-Glycol groupings are determined by periodic-acid oxidation. The results show that in the methylation process, and therefore in the formation of alkali cellulose, the secondary hydroxyls are the more active, the number of methylated secondary hydroxyls being ~ 3 times as great as the number of methylated primary hydroxyls. The content of α-glycol groupings indicates that one of the secondary hydroxyls of the glucose residue is much more reactive than the other. The results are substantially the same irrespective of the identity of the methylating agent and the extent to which adsorbed alkali may be present in the alkali cellulose; moreover, methylation of cellulose in the form of a soln. in 10% aq. NaOH gives essentially the same results as heterogeneous methylation. (Cf. J.S.D.C., **70**, 212 (1954).) A.E.S.

Weathering of Ethylcellulose Plastic—Extent of Various Types of Degradation
M. Chamberlain, R. A. DeLap, and C. L. Stacy
Ind. Eng. Chem., **48**, 1209–1211 (July 1956)

A study was made of the relative contributions of photo-oxidation, thermal oxidation, hydrolysis, and photolysis to the degradation of uncoloured, plasticised ethylcellulose on weathering. Photo-oxidation was considered to account for 95% of the breakdown. Quinolobenzyl ether, incorporated to the extent of 1% as an inhibitor, was effective in retarding photo-oxidation, but was unable to prevent appreciable degradation during exposure. W.K.R.

Synthesis and Reactions of Vinyl Ethers of Higher Polyhydric Alcohols and Cellulose. II—Vinyl Ethers of Cellulose
M. F. Shostakovskiĭ, E. N. Prilezhaeva, and L. V. Tsymbal
J. Gen. Chem. U.S.S.R., **26**, 739–745 (March 1956)

Treatment of alkali cellulose in presence of KOH with excess of acetylene in a dioxan medium at 130–150°C. (cf. J.S.D.C., **71**, 68 (1955)) yields vinylcelluloses which, according to conditions, vary in degree of substitution from 1·3 to 2·3 vinyl groups per glucose residue. Increase in degree of substitution is accompanied by increased solubility in dioxan and increased degradation of the macromolecule. A.E.S.

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Reaction of Hide Substance with Aromatic Tanning, Dyeing, and Auxiliary Materials
G. Otto
Leder, **6**, 207–215 (1955): *Chem. Abs.*, **50**, 9048 (25 June 1956)

Salt-type linkages and hydrogen bonds cannot explain all types of affinity between fibrous proteins and tannins, dyes or auxiliary agents. The aromatic ring with its system of conjugated double bonds is easily polarised with formation of dipoles, as are other compounds with such systems. These dipolar compounds are strongly attracted to the CO·NH or CO·N< groups of collagen. Introducing nitro groups in the benzene ring induces formation of dipoles and leads to a slight tanning ability. A tannin or dye having a strong electrostatic field caused by a sulpho or other group will be attracted to collagen by this force, and then firmly bound to it by dipolar forces provided the electrostatic and dipolar forces are far enough apart in the molecule. If they are too close together the dipole will be extinguished. Tannins can form cross-linkages between neighbouring collagen chains only if they are large enough or are sufficiently rich in weak polar forces. If they cannot form cross-links and contain electrovalent groups not neutralised by oppositely charged groups on the collagen, the ionic groups will attract water and cause swelling of the collagen. Many facts from the literature (24 references) are cited in support of the dipolar nature of certain types of tanning. C.O.C.

A Review of Fur-skin Dressing, its History and Methods
H. Kaplan
British Fur Trade, 418, 419, 422, 425, 478, 480 (Nov. and Dec. 1955)

Following a brief outline of the history of fur dressing it is stated that the first of the modern fur garments, the black fur-seal jacket, appeared only about 1842 and chemists first entered the industry around 1900. Until 1932 Leipzig was the world centre of fur dressing but now each centre of the fur trade—London, New York, Frankfurt, Paris, and Milan—has its own group of fur dressers. There is great variation in the processing of fur skins but generally it follows the lines of soaking in sterile brine, fleshing, pickling, and greasing. The most common pickling agents are sulphuric acid, lactic acid, alum and common salt and occasionally chrome or formaldehyde. Pickling is done either by immersion in the acid or salt solution or by brushing a concentrated solution on to the pelt. Alum-dressed furs are usually less stretchy than sulphuric-acid-pickled skins, more resistant to wetting and heavier. For special purposes, particularly Persian lambs, a fermentation or "meal" pickle is used. Bran, oats or similar cereal is fermented and the sour liquor applied by hand or by steeping. The liquor contains small quantities of organic acids but it is more likely that removal of mucoids by the proteolytic enzymes present is the real cause of the softness and lightness of the resultant leather. Chrome and semichrome are used on sheep, lambs and other skins which have to be hot processed, e.g. ironed, or dyed in hot liquors. Chrome yields a thicker and heavier pelt than acid dressing, tints the fur or wool pale green and gives risk of damage on subsequent bleaching or dyeing with use of peroxide. Formaldehyde gives a soft and light pelt but insufficiently stretching and although it does not affect the colour of the fur, the large amount taken up complicates subsequent dyeing. It is used to a limited extent in combination with acid or alum pickle. Vegetable tans are rarely used, they yield a thick heavy pelt, the fur is invariably tinted and the skins are very sensitive to alkali. After pickling the skins are hydroextracted, stretched and greased to impart softness, pliability and resistance to tearing. Fat-liquoring is not normally practised as it necessitates further treatment to remove the grease absorbed by the fur. There are two main methods of greasing, "stove" and "kicker". The stove method is suitable for thin-pelted and fairly open-grained skins, e.g. lambs, rabbits, foxes, sables. Sulphonated fish or animal oils together with paraffinic mineral oils are swabbed on to the pelt which is then stove dried at 90–120°F. under controlled R.H. In the kicker method sod oil, unsulphonated fish and animal oil, mineral oil and wool grease in combination are worked into the skin by wooden feet moving horizontally inside a wooden casing. It is only a mechanical adaptation of treading the oil into the skins by a man's feet. The skins are then drummed with sawdust to remove excess grease before stretching, handling or staking. Finally various mechanical treatments—shearing, ironing, beating with canes, combing or carding—are used to enhance the appearance of the furs. During the last two decades processing of woolled sheepskins has become a separate industry which uses various modifications of treatment with formaldehyde followed by hot ironing to produce the so called Beaver Lamb. The skins are soaked and fleshed and the wool scoured and deburred. Pickling and tanning follow, the best being a semichrome with a Cr_2O_3 content of about 1·5%. Oiling, drying, drum cleaning and staking follow after which the skins are examined for suitability for Beaver Lamb, the criteria being fine dense wool, soundness of grain, and freedom from ribbiness. The rejected skins are used for slipper linings, collars, rugs, etc. Preparation for dyeing Beaver Lamb involves considerable mechanical and chemical treatments to produce an evenly shorn surface having permanent gloss and free flowing fur. C.O.C.

Fur Dressing and Dyeing
A. Latour
Ciba Review, (114), 16–23 (April 1956)

An outline of the dressing and dyeing of fur-skins in both ancient and modern times and by savage and civilised men. C.O.C.

Electrostatic Forces in the Finishing of Furs
R. Vrbacký and V. Vrbacký
Kožařství, **5**, 14–19 (1955): *Chem. Abs.*, **50**, 9771 (10 July 1956)

The "feltability" of furs, particularly rabbit furs, is caused by static electricity. Apparatus is described for measuring the electrostatic potential of furs after they have been rubbed 10 times (U_{10}). On raw dry rabbit skin U_{10} was 560 v. on the spine, it rises on the cheek to 1210 v. and on the sides to 730 v. because the hairs become dense and they change the direction in which they lie. Feltability is higher in these places. After a formaldehyde–potash alum tannage U_{10} became 71, after chrome tannage 78, after pickling with 4% H_2SO_4 7 and after HCHO tannage 533. After dyeing U_{10} changes to 507, 445, 458 and 683 respectively. The lower U_{10} values after tannage are caused by presence of salts. U_{10} is lower on shorn rabbit furs. U_{10} increases after mordanting in the order: $K_2Cr_2O_7$, $FeSO_4$, $CuSO_4$, no mordant. Different amounts of Ursols in dyeing are without effect. Dyeing aniline black lowers U_{10}. Increasing the grease content has no influence. U_{10} can be lowered on dyed furs by treating them in salt solutions, NaCl being the most effective. $AlCl_3$ is also effective. Finished furs having no feltability have U_{10} 300–400 v., with medium feltability they have U_{10} 300–600 v. and with high feltability U_{10} of 500–1000 v. Feltability is determined by handle. The static charge imparted to furs by various mechanical processes is also described. C.O.C.

Peptides—Methods of Synthesis and Terminal-residue Studies
H. D. Springall and H. D. Law
Quart. Rev. Chem. Soc., **10**, (2), 230–257 (1956)

XIII—RUBBER; RESINS; PLASTICS

New Kinds of Macromolecules
C. E. H. Bawn
Endeavour, **15**, 137–143 (July 1956)

A review in which polymerisation processes, copolymers, graft and block copolymers, oriented polymers, and diene polymerisation are briefly discussed. W.R.M.

Rilsan [11-Nylon], Its Properties and Uses
R. Desalmo
Rev. franç. Corps gras, **3**, 266–272 (1956): *Chem. Abs.*, **50**, 9057 (25 June 1956)

One kg. of polymerised 11-aminoundecanoic acid (Rilsan) can be obtained from 3 kg. of castor oil. Its physical, mechanical and other properties are discussed as well as its use as a plastic material. C.O.C.

PATENT

Camouflage Material
J. H. Benecke, Hannoversche Wachstuch- & Kunstlederwerke *BP* 752,347

A sheet of thermoplastic synthetic resin or fabric impregnated or coated with such a resin, the resin being dyed and/or pigmented to give 95–25% infrared reflectance. C.O.C.

Properties of Periodate-oxidised Starch (III p. 492)

XIV—ANALYSIS; TESTING; APPARATUS

Improved Method of preparing Density-gradient Tubes
L. H. Tung and W. C. Taylor
J. Polymer Sci., **21**, 144–147 (July 1956)

A device to regulate flow rates of liquid to give a truly linear gradient tube. W.R.M.

Electron Microscopy
V. E. Coslett
Endeavour, **15**, 153–165 (July 1956)

Recent developments in methods of preparing material and the technique of section cutting are discussed. Progress made in studies of the fine structure of biological and inorganic material, the scope and the limitations of the method, and the principal difficulties in interpretation are reviewed. W.R.M.

New Moisture Meter
H. Gaegauf
Textil-Rund., **11**, 409–418 (July 1956)

A description of an apparatus, sensitive to changes of 0·2% R.H., for measuring the moisture content of paper and textiles. The material is placed between a heavy bed and a measuring head containing a hollow chamber. The material closes the chamber and sets up an R.H., which is measured electronically. Continuous measurement is possible. S.R.C.

Calcium Hydroxide as a highly Alkaline pH Standard
R. G. Bates, V. E. Bower, and E. R. Smith
Bur. Stand. J. Res., **56**, 305–312 (June 1956)

An aqueous solution of calcium hydroxide, saturated at 25°c., is recommended as a pH standard. The saturated solution is about 0·0203 M. and has a pH of 12·45 at 25°c. It has a rather large dilution value and a large temperature coefficient. W.R.M.

Colorimetric Estimation of Iron with Diphenylthio-violuric Acid
L. C. Malik and R. P. Singh
J. Indian Chem. Soc., **33**, 335–338 (May 1956)

Volumetric Determination of Zinc and Lead in Paint Pigments by the Ethylenediaminetetra-acetic Acid (EDTA) Method
M. A. O'Leary and V. Heines
Trans. Kentucky Acad. Sci., **16**, 80–84 (1955): *Chem. Abs.*, **50**, 9035 (25 June 1956)

The ferrocyanide and the EDTA methods are equally accurate for determining Zn in ZnO and lithopone. Dissolve the sample in conc. HCl and titrate aliquot parts with standard $K_4Fe(CN)_6$ with $(NH_4)_2WO_4$ as outside indicator. In the EDTA method neutralise the paint solution with dil. NH_4OH buffered with 30 ml. of a solution of 5 g. NH_4Cl and 380 ml. conc. NH_4OH diluted to 1 litre and titrate with 0·01 M-EDTA to a clear blue using Eriochrome Black T indicator. The back-titration and the sum-titration methods for Zn and/or Pb in leaded ZnO are also equally accurate but the former is the more rapid. To determine Pb hold the Pb in solution as the tartrate and bind the Zn as the cyanide complex, then titrate with 0·01 M-EDTA. When the end point is reached add dil. aq. HCHO to release the Zn from the cyanide complex and titrate the Zn against EDTA. In the sum-titration method, the cyanide complex is not formed; titration to a clear blue with the EDTA gives the Zn + Pb in the sample. Another aliquot portion is analysed for Pb as above. C.O.C.

Air-conditioning Unit for Fibre Research Laboratories
W. C. Timmerman
Text. Research J., **26**, 438–439 (June 1956)

A brief description of the ACCO Psychronditioner. This unit allows precision control of both temperature and relative humidity of the atmosphere in textile-testing laboratories. J.C.F.

Judgment of Harshness of Fabrics
H. Bogaty, N. R. S. Hollies, and M. Harris
Text. Research J., **26**, 355–360 (May 1956)

A series of similar fabrics made from wool and blends with mohair, viscose rayon, and nylon were judged for handle by a panel of observers. Both experienced and inexperienced observers participated. The evaluation of fabrics offered one at a time for judgment on an arbitrary scale of harshness was found to be as efficient in discrimination as the method of comparison with another fabric as reference standard. A single judgment by a single observer is of little value in discerning differences in harshness: replication of the observations or of the observers is useful in smoothing out differences in judgment among observers or in minimising a momentary error in judgment. The harshness judgments are discussed in terms of certain structural characteristics of the fabrics tested. It is suggested that the subjective harshness is related to the diameter of the fibres used and inversely to the length of the fibres projecting from the fabric surface. J.C.F.

Apparatus for Fatigue Tests on Fibres
N. P. Voevodina
Tekstil. prom., **16**, 51–52 (June 1956)

In the apparatus described, a fibre is subjected to extension–relaxation cycles at the rate of 200–600 per minute. The clamp at one end of the fibre vibrates at a

predetermined amplitude, and the other clamp moves automatically at the times of minimum tension to take up any permanent deformation that may occur. A.E.S.

Rapid Determination of Water and Fatty Matter on a Single Sample of Fibre
A. Parisot
Bull. Inst. Text. France, (60), 53–59 (May 1956)

The sample (6–9 g.) in a large test-tube is maintained at 60°C. in a water-bath, and a stream of dry air at ca. 500 mm. pressure is passed through the tube. Regain water is determined directly from the loss in weight of tube plus sample. This part of the determination is completed in 70 min. Then 50 ml. of methylene dichloride is run into the tube, and the sample worked in the solvent with a glass plunger. A 25-ml. aliquot is evaporated in a suitable tared vessel. The fatty matter estimation requires 25 min. The regain determination is comparable in precision with established methods. In certain cases the fatty matter determination may be subject to some error. J.C.F.

Standard Methods for the Removal of Added Matter from Textiles
Textile Institute Tentative Textile Standard No. 26 (1956)
J. Textile Inst., 47, P 374–P 379 (May 1956)

The procedure has been further modified, and is re-published for comment. J.W.B.

Systematic Identification of Mixed Fibres
Y. Utsumi, T. Ogawa, and A. Sawada
J. Soc. Textile Cellulose Ind. Japan, 12, 425–429 (June 1956)

Rapid Method of Estimating the Degree of Ripening of Cotton
W. Brunner
Textil Praxis, 11, 646–647 (July 1956)

After a review of various methods of estimating the amount of dead cotton present in this material in the loose state, a method is described based on the greenish fluorescence given by dead cotton in ultraviolet radiation, which is absent in the normal quality. It is claimed that this method can be used for separating dead cotton in bales of cotton. B.K.

New Cotton Lustremeter
D. Nickerson
Text. Research J., 26, 552 (July 1956)

Abstract of a paper describing an instrument for measuring the lustre of raw cotton and of grey and mercerised yarns. The sample is illuminated at 45°, and the reflected light measured at 0° (diffuse) and 45° (specular). The ratio of the two reflectances is read directly. J.C.F.

Iodine Sorption as an Index of Fibre Crystallinity
T. G. Majury
Text. Research J., 26, 437 (June 1956)

The author suggests that, under the conditions of the iodine sorption test, iodination of the acetyl groups of cellulose acetate may occur in addition to physical sorption. The use of secondary cellulose acetate as a standard of completely amorphous material in quantitative applications of the test may thus be open to criticism. J.C.F.

Determination of the Total Sulphur Content of Viscose
T. N. Kleinert
Textil-Rund., 11, 402–403 (July 1956)

The H_2O_2 oxidation method, especially in strong alkaline solution, results in a certain degradation of cellulose. In comparison with the $BaSO_4$ method, values obtained by the H_2O_2 method vary with the hemicellulose content. However, in any one spinning plant, little variation in hemicellulose content occurs, and the speed and simplicity of the H_2O_2 method favour its adoption in the works. S.R.C.

Determination of Residual Sulphur in Viscose Rayon
J. P. Fleury
Bull. Inst. Text. France, (59), 57–64 (April 1956)

A rapid and simple method for the determination of residual sulphur in viscose rayon is described. The sulphur is reduced to sulphide by alkaline $SnCl_2$, and the H_2S liberated on acidification is determined colorimetrically as methylene blue. Quantities of the order of 20 μg. of sulphur can be determined with an accuracy of 5%. The reproducibility of the method is good. J.C.F.

Differentiation by Staining of Cells isolated from the Orthocortex and from the Paracortex of Wool
M. Leveau
Bull. Inst. Text. France, (60), 61–64 (May 1956)

Cortical cells from the orthocortex of wool fibres are uniformly stained by Lactophenol Cotton Blue. Only the nucleus and cell membrane of cells from the paracortex are stained. In addition, the reagent causes longitudinal contraction and lateral swelling of cells from the orthocortex. Cortical cell preparations from (*a*) merino wool, (*b*) mohair, (*c*) human hair, and (*d*) rabbit hair are illustrated. All cells in (*b*) are stained; all cells in (*c*) also are stained, but the resistant nature of the fibre necessitates a more drastic treatment for the isolation of cortical cells, which may suffer degradation. The cells in (*d*) are stained to varying extents. J.C.F.

Estimation of Thiol Groups in Wool by means of 1-*p*-Chloromercuriphenylazo-2-naphthol
R. W. Burley

I— Intact Fibres
Text. Research J., 26, 332–336 (May 1956)

Thiol groups in intact wool fibres were determined by gently shaking with a solution of 1-*p*-chloromercuriphenylazo-2-naphthol (I) in freshly distilled, neutralised formamide in a sealed tube at 30°C. The time required to reach equilibrium was ca. 14 days for a merino wool and ca. 25 days for mohair. In the earlier stages of the reaction differential staining of the cortex of wool was apparent. The amount of reagent taken up by the fibre was obtained from the decrease in optical density of the solution. The reagent was standardised against glutathione and β-lactoglobulin, excess of reagent being quantitatively extracted with dimethylaniline. The following thiol group concn. (micromoles/g.) were obtained— merino wools 18–21, Cape mohair 32; disulphite-treated merino 42.

II— Supercontracted and Pulverised Fibres
Ibid., 336–340

In order to increase the rate of reaction of I with wool, the fibres were first either (*a*) supercontracted in boiling aqueous phenol (50% by wt.) for 10 min., or (*b*) pulverised by hand grinding under water for 30–40 min. For supercontracted fibres reaction with I was complete in 24 hr., and for pulverised fibres in 12 hr. Under the conditions of pretreatment described, thiol group concn. found in samples of merino wool and mohair agreed well with results on intact fibres from the same samples. J.C.F.

Damage to Wool— Swelling Test in Ammoniacal Potash
C. H. Schirlé, O. Meyer, and G. Gianola
J. Textile Inst., 47, P 486–P 491 (July 1956)

Wool fibres are treated in ammoniacal KOH at 40°C., and the swelling is measured by microscopical observation. They are tested in batches of 10, mounted across a glass slide, and a total of 100 fibres are measured. A curve is drawn of the cumulative frequencies of swelling, and the average swelling for 50% of the fibres (G_{50}) is determined graphically. The test is applied to fibres damaged by alkali (Na_2CO_3 and NaOH), H_2SO_4, H_2O_2, $KMnO_4$, and thioglycollic acid. There are three general tendencies— (1) The swelling is greater than for undamaged wool after acid, oxidation, and reduction treatments, G_{50} increasing with severity of treatments, attaining a maximum, and then diminishing. The maximum is not very pronounced with $KMnO_4$-treated wool, but is very high after H_2O_2 treatment. (2) Swelling is less than that of untreated wool when the wool is subjected to heat and light. The swelling passes through a minimum and then increases. (3) Alkalis give different results according as NaOH or Na_2CO_3 is used, the latter giving increased swelling for low damage, but decreased swelling for heavy damage. Na_2CO_3 results in less swelling than untreated wool. The test appears to be analytically sound, and it is believed that, though tedious, it may be useful. J.W.B.

Preparation of Fibres from Small Quantities of Protein Solutions
J. P. E. Human
Text. Research J., 26, 439–440 (June 1956)

Fibre extrusion tests on as little as 0·5 ml. of protein solution may be made in the apparatus described. Results of tests on protein fractions extracted from reduced wool are briefly described. J.C.F.

Colour Reaction of Amino Acids with Alloxan, Isatin, and Ninhydrin in Circular Paper Chromatography
A. Saifer and I. Oreskes
Anal. Chem., **28**, 501–504 (April 1956)

The colour reactions of 51 amino acids with alloxan (I), isatin (II), and ninhydrin (III) have been studied and their sensitivity as spot tests on filter paper has been determined. R_f values have been determined by circular paper chromatography using phenol- and butanol–acetic acid as developing solvents. I gives stable and uniform colours with most amino acids and it is more sensitive than III with some of them. Single components of mixtures of amino acids having similar R_f values may often be determined by applying these reagents simultaneously to sectors from one chromatogram. In view of its wide variety of colour reactions and its lack of reactivity with many amino acids, II is the most useful for this purpose. The nature of the colour reactions involved is discussed, and their possible application to amino acid mixtures is indicated. J.W.D.

Evaluation of Bacteriostatic Reagents, and Methods of Application to Textile Fabrics
J. C. Sherrill
Text. Research J., **26**, 342–350 (May 1956)

A chemical method for the evaluation of the bacteriostatic efficiency of antiseptic agents is described. Treated samples of fabric are impregnated with a standard urea–citrate medium and inoculated with *Proteus vulgaris*. After incubation at 37°c. for 18 hr. the medium is extracted from the fabric, and the ammonia present is determined by a semi-micro Kjeldahl technique. The method has been used (i) to compare the efficiency at various dilutions of bacteriostatic compounds representing the principal chemical types, both in solution and on impregnated fabrics, and (ii) to obtain data on the application of bacteriostatic agents in commercial laundry practice. J.C.F.

Dominance Order for Red-Green-defective Alleles
R. W. Pickford
Nature, **178**, 49–50 (7 July 1956)

Statistical tests of 126 red-green-defective men and women give results in agreement with the theory of Francoeschetti, which suggests that there is a dominance order for each of the two series of multiple alleles, such that genes producing lesser defects are dominant to those producing greater defects and that the two normal genes are most dominant. W.R.M.

Colorimetric Evaluation of Colour Gradients in the Woollen and Worsted Industries
R. E. Derby
Amer. Dyestuff Rep., **45**, P 406–P 409, P 415 (18 June 1956)

The unevenness of unevenly dyed fabrics is evaluated as a colour gradient, the method being based on spectrophotometric colorimetry coupled with statistical analysis. A strip of fabric is divided into 3 sections, and 3 or 4 measurements are made on each area, the number depending on the variation. The measurements are averaged, and the colour differences calculated between the various areas by means of the Adams–Nickerson equation. If any difference $> 0{\cdot}5$ unit (using 40 as the constant in the colour-difference equation) exists between any two areas, the piece may be called "shady", though greater differences may be acceptable, depending on the market. If there is more variation within an area than between areas, and the difference is $> 0{\cdot}5$, the piece is designated "colour streaked" or "cloudy". J.W.B.

Differential Dyeing as Method for studying the Diffusion and Absorption of Direct Dyes in Viscose Rayon Fibres—I
N. Iwanow and R. Schneider
Bull. Inst. Text. France, (60), 7–36 (May 1956); *Text. Research J.*, **26**, 407–422 (June 1956)

A special microcell is described for the study of the kinetics of the axial penetration of dyes into viscose rayon fibres. Comparative series of tests are made on the same fibre by extracting the dye with aqueous pyridine after each dyeing. The method gives highly reproducible results. The dyes used in this investigation were Chlorazol Sky Blue FF (*C.I.* 518) and Congo Red (*C.I.* 370). The following aspects of the problem have been studied in detail— (*a*) influence of electrolyte concn., dye concn., and nature of the dye on diffusion; (*b*) migration of dye after interruption of the initial penetration process; (*c*) diffusion of dyes in pre-dyed fibres. J.C.F.

High-temperature Dyeometer—an Instrument for studying Colour Reactions at Elevated Temperatures
R. Stanziola and F. Fordemwalt
Amer. Dyestuff Rep., **45**, 365–372 (4 June 1956)

An apparatus is described in which 400 ml. of dye liquor can be raised to any temperature up to 300°F., the sample being dropped into the liquor by operating a valve actuated by compressed nitrogen. The liquor is circulated through a transmission cell, and dye concentrations can be measured continuously. Measurements are made of dye stability at high temperatures, and of exhaustion rates. Examples are given showing the rate of chroming of wool at 230°F., and the exhaustion rates of basic dyes on Orlon 42; studies are also made of direct dyes on cotton, and of disperse dyes with regard to both stability and exhaustion. J.W.B.

Recent Problems in Testing the Light Fastness of Dyeings
K. Hoffmann
Melliand Textilber., **37**, 205–210 (Feb. 1956)

Following a general description of factors connecting fading with irradiation, it is shown that experiments in which wool dyeings of Acilan Brilliant Blue R (which has a light fastness rating of 1–2) were exposed to monochromatic radiation indicate that, with the longer wavelengths, the activity is higher when the irradiation falls within the absorption range of the dyeings. H.K.

Progress Report on Suntesting
C. H. A. Schmitt
AATCC Committee on Fastness to Light
Amer. Dyestuff Rep., **45**, P 482–P 483 (16 July 1956)

Comparative Exposure Tests with Daylight and with Artificial Light
A. Schaeffer
Melliand Textilber., **37**, 94–98 (Jan. 1956)

Comparative tests on natural and artificial fibres with different classes of dyes show that for 51 of 171 dyeings the Fade-Ometer light fastness rating differed by 1–2 points from the ratings of patterns exposed under glass to daylight. With the Hoffmann rapid-exposure apparatus only 4 of the 171 dyeings differed in light fastness ratings from those obtained in daylight. H.K.

Determination of Hydroxyalkyl Groups in Low-substituted Starch Ethers
H. J. Lortz
Anal. Chem., **28**, 892–895 (May 1956)

In a modified alkoxyl apparatus constant-boiling HI cleaves ether linkages and hydroxyalkyl groups are quant. decomposed into ethyl iodide and ethylene; these may be determined volumetrically in standard soln. of $AgNO_3$ and Br_2 respectively. The apparatus and procedure as described in the paper are suitable for samples having 0·005–0·20 hydroxyalkyl group per anhydroglucose unit. The method is applicable to low-substituted ethers of materials other than starch, e.g. cellulose, and may also be used in the analysis of ethers and esters of ethylene glycol. J.W.D.

Condensates for Resin Finishing. XVI and XVII—Method of Determining the Optimum Baking Time on Resin-treated Fabrics
H. Sobue, Y. T. Chi, and K. Murakami
J. Soc. Textile Cellulose Ind. Japan, **12**, 405–411 (June 1956)

Methods of determining the most effective baking time for resin-treated fabrics have been studied by using certain properties of treated fabrics (amount of resin removed from fabrics by soaping, crease angle, acid dye, luminous dye, shrinkage and swelling) without using direct measurement as before. Attempts were made to determine the optimum baking time by three out of the five above methods for fabrics resin-treated under each condition. Some relationships between time of baking and the measurements were observed. AUTHORS

Rapid Spot Test for the Identification of Aminoplasts on Textiles
W. J. Van Loo, J. M. Salsbury, and F. L. Andrew
Amer. Dyestuff Rep., **45**, 397–398, 421 (18 June); 506 (16 July 1956)

Solutions required for the spot test are I— 1% phenylhydrazine, prepared by dissolving 1 g. of phenylhydrazine

in 99 g. of 40% (wt./wt.) aq. H_2SO_4; and II— 10% (wt./wt.) aq. $FeCl_3$. The cloth should be white or contain white areas, although pastel colours may be employed. A drop of I is placed on the cloth and allowed to stand for 30 sec., note being made of any colour changes. Excess of liquid is removed by blotting. A drop of II is applied to the same spot, the immediate colour change, and that during the next 30 sec., being observed. A table is given whereby positive identification of many finishes is possible. Theoretical aspects are briefly discussed. J.W.B.

Colorimetric Determination of Chromium
M. Banerjee, I. B. Sarker, and S. Sen
J. Leather Tech. Assocn. (India), **3**, 111 (1955): *J. Soc. Leather Trades Chem.*, **40**, 205 (June 1956)

The solution of sexavalent Cr (0·01–0·03 g./litre) is treated under standard conditions with H_2SO_4 and a 0·25% soln. of diphenylcarbazide; the colour produced is measured in a suitable photoelectric colorimeter (green filter 404), and the Cr content obtained from a calibration curve. C.J.W.H.

Proposed Official Methods for the Determination of the Acidity of Vegetable-tanned Leather
D. Burton (Convener)
J. Soc. Leather Trades Chem., **40**, 245–247 (Aug. 1956)

Three methods are proposed— the Procter–Searle method (*J.I.S.L.T.C.*, **23**, 273 (1939)); the method of R. F. Innes (*J.I.S.L.T.C.*, **12**, 256 (1928)); and the method of Atkin and Thompson (*J.I.S.L.T.C.*, **13**, 300 (1929)). Each method is given in detail. The first-named is the most widely used, though it is not always reliable as indicating the presence of strong mineral acid. The presence of sulphur-containing cpd. such as sulphited extracts and sulphated oils will lead to high Procter–Searle values. J.W.D.

Proposed Official Method for the Determination of the Neutralisation Value (Buffer Capacity) of Vegetable-tanned Leather
D. Burton (Convener)
J. Soc. Leather Trades Assocn., **40**, 248 (Aug. 1956)

The method described is that of Burton (*J.I.S.L.T.C.*, **21**, 254 (1937)). J.W.D.

New Instruments for Measuring the Colour of Leather
J. A. Sagoschen
Öst-Leder-Z., **10**, 169 (1955): *J. Soc. Leather Trades Chem.*, **40**, 206 (June 1956)

Previous work on measuring the colour of leather is reviewed. Two new forms of apparatus are described— the Leiser and the Metricolor— which have proved satisfactory on test. C.J.W.H.

Differential Measurements with a Photoelectric Colorimeter
F. E. Downs
J. Soc. Leather Trades Chem., **40**, 240–241 (July 1956)

When the *J* 20 colorimeter is used in measuring the colour of leather patterns of low luminance, or with which the *X* or *Z* component is very low, a small error in the galvanometer reading has a disproportionate effect on the final C.I.E. figure. A procedure based upon the use of three differential scales and a substandard (yellow ferrite pigment) is described, whereby these difficulties are overcome. J.W.D.

Proposed Official Method for the Determination of Colour Tolerances
Society of Leather Trades' Chemists, Colour Measurement Committee
J. S. Mudd (Convener)
J. Soc. Leather Trades Chem., **40**, 191–194 (June 1956)

The method already reported by the same Committee (*ibid.*, **40**, 41 (Feb. 1956)). J.W.D.

Proposed Official Method for the Determination of Fastness to Daylight of Coloured Leather
Society of Leather Trades' Chemists, Fastness Tests Committee
C. J. Pittard (Convener)
J. Soc. Leather Trades Chem., **40**, 184–190 (June 1956)

The method is based on *B.S.* 1006. It is insisted that the light-fastness rating corresponding to the change in the sample after short exposure should be included in the final reported result. Where a change of colour occurs it also should be indicated, e.g. "7(3) bluer". J.W.D.

Proposed Official Method for the Assessment of Fastness to Washing of Leather
Society of Leather Trades' Chemists, Fastness Tests Committee
C. J. Pittard (Convener)
J. Soc. Leather Trades Chem., **40**, 183–184 (June 1956)

The sample is washed five times with a standard soap soln. under specified conditions, rinsing after each wash. After drying at 60°c. the change in the sample is assessed by means of the Standard Grey Scale. J.W.D.

Method of Testing Resistance of Coloured Leathers to Bleeding
American Leather Chemists Association, Leather Finishes Committee
B. A. Roll (Chairman)
J. Amer. Leather Chem. Assocn., **51**, 429–430 (Aug. 1956)

Four squares of cotton cloth are soaked in distilled water for 5 min., stacked together on a glass plate, and the whole is inverted on to the leather sample held on another plate. The whole sandwich is held at 120°F. for 12 hr. Migration is designated 1–4 according to the cloth to which bleeding has penetrated (1 is nearest to the leather); the predominant colour of the bleeding, and the intensity (termed "none", "slight", "moderate", or "considerable") of bleeding on cloth 1, are also noted. J.W.D.

Bonding Film Adhesion Test for Leather Finishes
C. A. Burkart, N. D. Gallagher, and M. B. Neher
J. Amer. Leather Chem. Assocn., **51**, 418–428 (Aug. 1956)

The test measures the adhesion of finish to leather independently of other finish properties such as elasticity and flexibility. A Cu strip is bonded to the leather finish by means of a heat-activated phenolic film (or "bonding film"). The force required to remove the Cu strip, bonding film, and finish vertically from the leather surface is determined by conventional tensile test apparatus. The finishes on kid leathers show very low adhesion values, cowhide shoe-upper leathers show intermediate values, and upholstery leathers show high values. Within prescribed limits, variations in temp., pressure, and time of application of pressure during the preparation of the specimens do not significantly affect the adhesion values obtained. Bonding films at present available will not adhere to all types of finish. The 95% confidence limits are ±0·78 lb./in. for a single test result. There is a drawing of the apparatus. J.W.D.

PATENTS

Measuring the Lustre of Continuous Threads
British Nylon Spinners *BP* 756,864

Yarn and Monofilament Evenness Testers
Commonwealth Scientific & Industrial Research Organisation *BP* 754,919

Extensometer for use with Testing Machines
Saml. Denison & Son *BP* 755,998

Fluorescent Brightening Agents (IV p. 496)
Relaxation of Internal Strains in Wool Materials (VI p. 501)
Influence of Histological Factors on the Attack of the Wool Fibre by Various Reagents (VI p. 502)
Fading of Dyeings by Weathering (VIII p. 504)

XV— MISCELLANEOUS

Perkin as Scientist
W. Bradley
Ciba Review, (115), 23–28 (June 1956)

Perkin, the Manufacturer
W. Bradley
Ciba Review, (115), 29–35 (June 1956)

The Legacy of Perkin
W. Bradley
Ciba Review, (115), 36–40 (June 1956)

Chemistry and Chemical Education in Perkin's Student Days
J. Schroeter
Ciba Review, (115), 15–22 (June 1956)

Some Aspects of Luminescence
G. F. J. Garlick
Endeavour, **15**, 144–148 (July 1956)

Luminescence phenomena are discussed from the point of view of energy-transfer processes. W.R.M.

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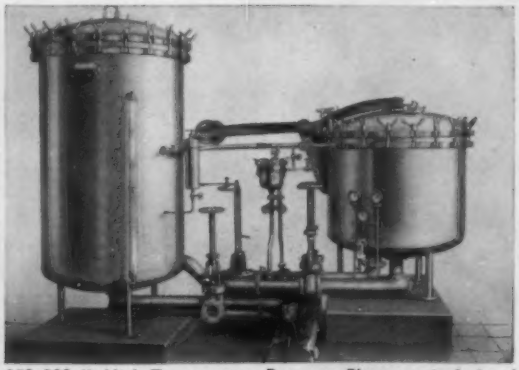

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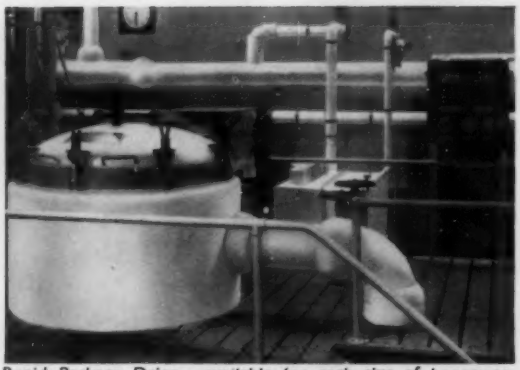

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FORTHCOMING MEETINGS OF THE SOCIETY—*continued from page* xii

Monday, 14th January 1957

BRADFORD JUNIOR BRANCH. *The Use of Fading Lamps for Determining Light Fastness.* P. R. Dawson, Esq. (I.C.I. Ltd.). Technical College, **Bradford.** 7.15 p.m.

Tuesday, 15th January 1957

SCOTTISH SECTION. *Application of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I. and P. H. Oliver, Esq., B.Sc., Grad.Inst.P. (Courtaulds Ltd.). St. Enoch Hotel, **Glasgow.** (Joint Meeting with Textile Institute.) 7.15 p.m.

Friday, 18th January 1957

MANCHESTER SECTION. *A New Approach to the Dyeing of Hydrophobic Fibres.* D. Garrett, Esq. (I.C.I. Ltd.). Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

WEST RIDING SECTION. Ladies' Evening. Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 22nd January 1957

HUDDERSFIELD SECTION. *Application of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I. and P. H. Oliver, Esq., B.Sc., Grad.Inst.P. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 23rd January 1957

MIDLANDS SECTION. *Problems in the Processing of Rayon Blends.* R. C. Cheetham, Esq., A.M.C.T., F.R.I.C., and H. D. Edwards, Esq., Ph.D., A.R.I.C. College of Technology, **Leicester.** 7 p.m.

Tuesday, 29th January 1957

BRADFORD JUNIOR BRANCH. *The Work of a Colourist in a Man-made Fibres Dyehouse.* J. T. Lynes, Esq. (Courtaulds Ltd.). Technical College, **Bradford.** 7.15 p.m.

Thursday, 31st January 1957

WEST RIDING SECTION. Discussion, *Detergency.* Panel—R. S. Hartley, Esq., A.R.I.C. (Wool Industries Research Association), G. H. Rostron, Esq., A.R.I.C. (Joseph Crosfield & Sons Ltd.), R. C. Tarring, Esq., B.Sc., A.R.C.S. (Shell Chemicals Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 1st February 1957

LONDON SECTION. *A Review of the Colour Fastness Requirements in Dyed Textiles.* T. H. Morton, Esq., M.Sc., Ph.D., F.S.D.C. (Courtaulds Ltd.). (Joint meeting with the London Section of the Clothing Institute.) Royal Society, Burlington House, **London W.1.** 6 p.m.

Wednesday, 13th February 1957

NORTHERN IRELAND SECTION. *Fifty Years Dyeing Linen in Ireland.* N. McCraith, Esq., B.Sc. (Joint Meeting with Textile Institute.) Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

BRADFORD JUNIOR BRANCH. *Finishing of Garments and Fabrics made from Bulked "Terylene" Yarns and Filaments.* G. McLewy, Esq., B.Sc., Ph.D., A.R.I.C. (I.C.I. Ltd. Terylene Council). Technical College, **Bradford.** 7.15 p.m.

Thursday, 14th February 1957

WEST RIDING SECTION. *Applications of Colour Physics to Textiles.* J. C. Guthrie, Esq., M.Sc., F.Inst.P., F.T.I. P. H. Oliver, Esq., B.Sc., Grad.Inst.P. (Courtaulds Ltd.). Hotel Metropole, King Street, **Leeds.** 7.30 p.m.

Friday, 15th February 1957

MANCHESTER SECTION. *Problems in the Wet Processing of Rayon Blends.* H. D. Edwards, Esq., Ph.D., A.R.I.C and R. C. Cheetham, Esq., A.M.C.T., F.R.I.C. (Courtaulds Ltd.). Textile Institute, 10 Blackfriars Street, **Manchester.** 7 p.m.

Tuesday, 19th February 1957

HUDDERSFIELD SECTION. *Petroleum Chemicals in the Textile Industry.* H. Bratherton, Esq., A.M.C.T., A.T.I. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 20th February 1957

MIDLANDS SECTION. *Basic Mechanisms of Winch Processing.* R. H. Waddington, Esq., B.Sc. Albert Hall Institute, **Nottingham.** 7 p.m.

Thursday, 28th February 1957

WEST RIDING SECTION. *The Applications of Fluid Beds to Dyeing.* J. Wilson, Esq., M.C., M.Sc. and F. G. Audas, Esq. (British Rayon Research Association). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Thursday, 7th March 1957

BRADFORD JUNIOR BRANCH. Lecture. Details later.

Friday, 8th March 1957

LONDON SECTION. *Soiling of Natural and Synthetic Fibres.* G. G. Taylor, Esq., B.Sc., A.Inst.P. (Clayton Dyestuffs Co. Ltd.). Royal Society, Burlington House, **London W.1.** 6 p.m.

Wednesday, 13th March 1957

NORTHERN IRELAND SECTION. *Problems in Wet Processing of Rayon Blends.* H. D. Edwards, Esq., Ph.D., A.R.I.C. and R. C. Cheetham, Esq., A.M.C.T., F.R.I.C. (Courtaulds Ltd.). Thompson's Restaurant, Donegall Place, **Belfast.** 7.30 p.m.

Thursday, 14th March 1957

WEST RIDING SECTION. *The Dyeing of Acrylic Fibres.* K. Meldrum, Esq., B.Sc., A.R.I.C. (Courtaulds Ltd.). Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Tuesday, 19th March 1957

HUDDERSFIELD SECTION. Annual General Meeting. Silvios Cafe, Westgate, **Huddersfield.** 7.30 p.m.

Wednesday, 20th March 1957

MIDLANDS SECTION. *Developments in Sizing as they affect the Dyer and Finisher.* J. H. MacGregor, Esq., Ph.D., F.R.I.C., and E. France, Esq., A.R.C.S., A.M.C.T. (Joint with the British Association of Chemists.) Midland Hotel, **Derby.** 7 p.m.

Friday, 22nd March 1957

BRADFORD JUNIOR BRANCH. Annual Dance. Connaught Rooms, **Bradford.**

Saturday, 23rd March 1957

NORTHERN IRELAND SECTION. Annual General Meeting and Dinner. Woodbourne House Hotel, **Belfast.** Details later.

Thursday, 28th March 1957

MIDLANDS SECTION. *The Soiling of Natural and Synthetic Fibres.* G. G. Taylor, Esq., B.Sc., A.Inst.P. (Joint with the Textile Institute.) Carpet Trades Canteen, **Kidderminster.** 7.30 p.m.

WEST RIDING SECTION. Annual General Meeting. Victoria Hotel, Bridge Street, **Bradford.** 7.30 p.m.

Friday, 29th March 1957

The Society's Annual Dinner. The Grosvenor House, Park Lane, **London.**

Friday, 12th April 1957

MIDLANDS SECTION. Annual Dinner. George Hotel, **Nottingham.** 7 p.m.

Wednesday, 17th April 1957

MIDLANDS SECTION. . . . . *and inwardly digest* (*a Dissertation on Technical Literature*). S. Burgess, Esq., F.S.D.C., A.M.C.T. (Preceded at 6.30 p.m. by the Annual General Meeting of the Section). King's Head Hotel, **Loughborough.** 7 p.m.

Saturday, 20th April 1957

BRADFORD JUNIOR BRANCH. Annual General Meeting. Technical College, **Bradford.** 10.15 a.m.

Friday, 3rd May 1957

MIDLANDS SECTION. The Mercer Lecture of the Society. Grand Hotel, **Leicester.** 7 p.m.

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All inquiries relating to Advertisements should be addressed to THE GENERAL SECRETARY, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKSHIRE.

Replies may be addressed Box —, THE SOCIETY OF DYERS AND COLOURISTS, DEAN HOUSE, 19 PICCADILLY, BRADFORD 1, YORKSHIRE, where all communications relating to these Advertisements are treated in strict confidence.

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JOURNALS WANTED

The Society is urgently wanting Journals for all months of 1955 except July and December. The months of August and September 1955 are particularly required. Copies of January, February, March, and April 1956 issues are also in demand. Please address communications to the General Secretary.

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Bowler, Roger Francis, 35 Ford Lane, Allestree, Derby

Byler, George Griffith, c/o Philadelphia Textile Institute, 3243 School House Lane, Philadelphia 44, Penna., U.S.A.

Hastings-Long, John A. D., 17 Aston Drive, Bramley, Leeds 13

Holt, F., 28 Pennington Street, Walshaw, near Bury

Holt, John, 27 Milton Drive, Boreham Wood, Herts.

Hubler, Beno, Park Hotel, Oak Avenue, Manningham, Bradford

Hughes, William H., 2910 Woodpipe Lane, Philadelphia 29, Penna., U.S.A.

Kapoor, Jai Narain, 42 B.C. Chatterji Street, Belgharia, 24 Parganas, W. Bengal, India

Lawrence, George Edward, c/o Union International Co. Ltd., Watsons Road, Wood Green, London N.22

Sarkar, Asim Kumar, "Tower House", Barnes Road, Castleford

Sheikh, Akhlaq Ahmad, c/o Fanji Textile Mill, Jhelum, West Pakistan.

Telesz, Ludwik Alojzy, 118 Somersby Road, Woodthorpe, Nottingham

Wolstenholme, Stanley, 3 William Street, Hurstead, Rochdale, Lancs.

Younis, Mohammed Tayyeb Haj, c/o Haj Younis Weaving Co. Ltd., Mosul, Iraq.

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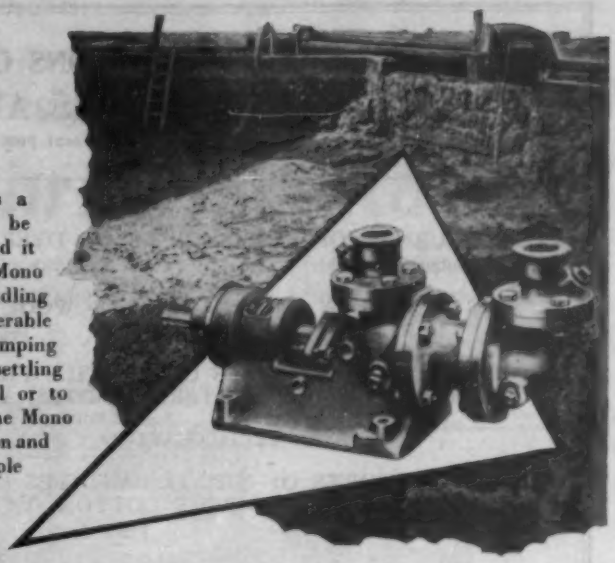

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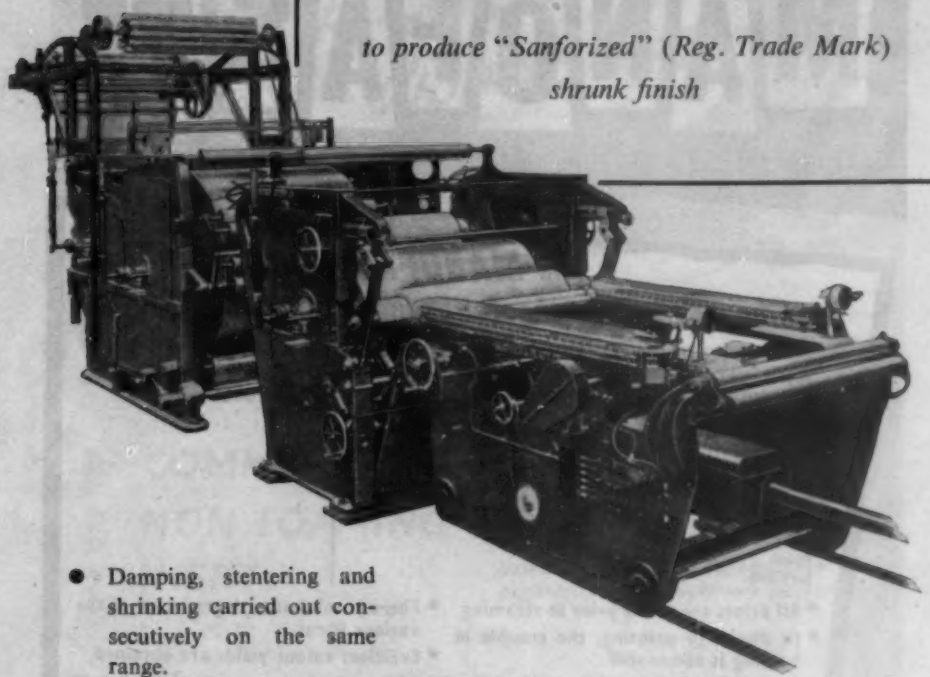

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